

A REVIEW OF THE SPARIDÆ AND RELATED FAMILIES OF PERCH-LIKE FISHES FOUND IN THE WATERS OF JAPAN.

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In the present paper is given a review of the species of fishes belonging to those percomorphous families allied to the Sparoid fishes, or fishes related to the tai or porgy of the waters of Japan, which have not been hitherto discussed in these pages by the senior author and his associates. The families of Kuhliidæ, Priacanthidæ, Theraponidæ, Banjosidæ, Hæmulidæ, Sparidæ, Kyphosidæ, and Erythrichthyidæ are thus included.

The paper is based on material collected in Japan in 1900 by Professors Jordan and Snyder and now divided between the United States National Museum and the museum of Stanford University. Most of the cuts are from drawings by Mr. Sekko Shimada.

The families here named are adopted provisionally only. The distinctions between Sparidæ, Hæmulidæ, Lutianidæ, and their relatives are of doubtful value, while at present no definite boundaries can be assigned to the Serranidæ.

1. Family KUHLIIDÆ.

Body oblong, strongly compressed; scales large, ciliated. Lateral line complete, the tubes straight and occupying the half or more of the exposed surface of the scale. Mouth rather large, protractile; maxillary exposed, without supplemental bone; teeth in jaws in villiform bands; teeth on vomer, palatines, entopterygoids, and ectopterygoids; tongue smooth; head partly naked; preorbital and preopercle denticulate; opercle with 2 spines. Gill membranes separate; 6 branchiostegals; pseudobranchiæ large; gill-rakers long and slender. Dorsal fins connected at the base, with X, 9 to 13 rays, the spinous portion longer than the soft. Anal as much developed as the soft dorsal, with III, 10 to 12 rays. Dorsal and anal fins fitting in a well-developed sheath. Caudal emarginate. Pectorals obtusely pointed, with 14 or 15 rays, upper the longest. Ventrals behind base of pec-

torals, close together, with a strong spine. Posterior processes of the premaxillaries not extending to the frontals; supraoccipital bone extending forward to between the post-frontal processes, its crest not extending on the upper surface of the cranium; parietals short, without crest. Precaudal vertebræ with transverse processes behind the fourth; ribs, all but the last 2 to 4, sessile, inserted on the centrum behind the transverse processes. Vertebræ 25 (10 or 11 + 14 or 15). Two genera with 7 or 8 species inhabiting the Pacific Ocean, especially fresh and brackish waters of East Africa, and the islands of the Indian and Pacific Oceans and north Australia, some species strictly marine. Doctor Boulenger has shown in *Kuhlia* the presence of skeletal characters of the American family of sun fishes, Centrarchidæ. In his Catalogue, *Kuhlia* is placed in the latter family, but there are important differences and the natural character of the group Centrarchidæ disappears if these fishes are introduced. We therefore continue to recognize the family of Kuhlidiæ as distinct. In appearance, as in habit, the species of *Kuhlia* resemble the black bass.

Key to genera.

- a*¹. Maxillary short, $2\frac{2}{3}$ in head; soft dorsal and anal long and low; gill-rakers 10+25; peritoneum black. Marine species *Boulengerina*, 1.
*a*². Maxillary long, 2 to $2\frac{1}{3}$ in head; soft dorsal and anal shorter and higher; gill-rakers about 9+18; peritoneum silvery, dotted. Species inhabiting rivers. . *Kuhlia*, 2.

1. Genus BOULENGERINA Fowler.

Boulengerina FOWLER, Journ. Acad. Nat. Sci. Phila., 1906, p. 512.

Type.—*Dules mato* Lesson = (*Dules malo* Cuvier and Valenciennes).

This genus includes the marine species of Kuhlidiæ, with the mouth relatively small, the maxillary $2\frac{1}{3}$ in length of head, the caudal deeply forked, the soft dorsal and anal fins long and low, the scales relatively small, and the body silvery in color, gill-rakers about 10 + 25. Tropical Pacific, especially about coral reefs.

(Named for George Albert Boulenger of the British Museum.)

1. BOULENGERINA TÆNIURA (Cuvier and Valenciennes).

GINDOKUGYO (poison silver perch).

Dules tæniurus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 114 (Java).—BLEEKER, Verh. Bat. Gen. Kunst. Wet., vol. 22, Pisc., 1849, p. 49 (Pagotang, Java).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 267 (Chinese Seas).—KNER, Reise Novara, Fische, 1860, p. 47 (Tahiti).

Paradules tæniurus BLEEKER, China, Ned. Tijd. Dierk., vol. 4, 1873, p. 139.

Moronopsis tæniurus KLUNZINGER, Fische Roth. Meer., 1884, p. 25.

Kuhlia tæniura JORDAN and BOLLMAN, Proc. U. S. Nat. Mus., vol. 12, 1889, p. 159, name only).—BOULENGER, Cat. Fish. Brit. Mus., 2d ed., 1895, p. 39 (Socotra, Zanzibar, Seychelles, Port Natal, South Africa, Mauritius, Laccadives, China, Tahiti).—JORDAN and SEALE, Fishes Samoa, Bull. U. S. Bur. Fish., vol. 25 (1905), 1906, p. 255 (Tutuila, Samoa, Johnston Island, Marcus

Island, Tubuai, Paumotu Island, Tahiti).—JORDAN and STARKS, Fishes Tanega and Yaku, Proc. U. S. Nat. Mus., vol. 30, 1906, p. 698 (Tanegashima).—SEALE, Fishes South Pacific, Bishop Mus., vol. 4, No. 1, 1906, p. 34 (Fate, New Hebrides).

Perca argentea BENNETT, Fish. Ceylon, 1830, pl. 22, (Ceylon).

Dules argenteus KLUNZINGER, Syn. Fische Roth. Meer., Verh. z. b. Ges. Wien., vol. 20, 1870, p. 730 ("Zwei Brüderinseln, Koseir").—GÜNTHER, Fische Südsee, 1873, p. 25, pl. 19, fig. C (Tahiti, Kingsmill Islands).—DAY, Fishes India, 1875, p. 67, pl. 18, fig. 2 (India); Fauna India, vol. 1, 1889, p. 504.

Dules bennetti PETERS, Monatsber. kön. Akad. Wiss. Berlin, 1855, p. 432 (Mozambique, fresh water).—GÜNTHER, Cat. Fish. Brit. Mus., 1859, vol. 1, p. 270 (no locality).

Kuhlia arge JORDAN and BOLLMANN, Proc. U. S. Nat. Mus., vol. 12, 1889, p. 159 (Chatham Island, Galapagos Archipelago).—JORDAN and EIGENMANN, Bull. U. S. Fish. Comm., vol. 8, 1890, p. 419.—JORDAN and EVERMANN, Fishes N. and M. Amer., vol. 1, 1898, p. 1014 (Clarion Island, Chatham Island), (American specimens, the eye described as a little smaller, but in fact agreeing entirely with Samoan examples).

Habitat.—Coral reefs of the tropical Pacific from the offshore islands of Mexico to Japan and East Indies.

Description of numerous small specimens, the longest 65 mm. in length, from Tanegashima, Japan, collected by Anderson and Anderson, and of two adults, 210 and 225 mm. in total length, from Okinawa, one adult from Misaki, besides four from Samoa, and one from Lord Howe Island in Australia, agreeing with the Japanese specimens in all regards. Specimens typical of *Kuhlia arge* from offshore islands of Mexico are also included.

Head $3\frac{3}{4}$ in body length; depth $2\frac{3}{4}$; eye 3 in head; snout 4; maxillary, $2\frac{3}{4}$; interorbital space 3; D. IX–I, 10; A. III, 11; scales in lateral line 53, in transverse series $6\frac{1}{2}$ –11 or 12 from insertion of dorsal to anal; gill-rakers 10 + 25.

Body profile not symmetrical, highest part of line of back much behind lowest part of belly line; that of head straight dorsally; the width of body lessening quickly from above lateral line to the narrow ventral edge; caudal peduncle long, from last anal rays to last vertebra contained $1\frac{1}{2}$ in head, and as long as anal base. Tip of snout at or above middle point of eyes. Maxillary short, not extending beyond anterior third of eyes; mandible articulated under anterior half of eye, its length $2\frac{1}{2}$ in head. Preorbital and preopercle serrated very plainly, the latter's angle somewhat produced and emarginate on the vertical border. Lower opercular spine not extending behind upper pectoral base. Teeth on vomer and palatines rather feeble in adults, those on jaws in one row laterally in mandible, in upper jaw in a moderately broad band.

Dorsal spines stiff, fourth highest, contained $1\frac{1}{2}$ in head, penultimate two-thirds length of last, which is 3 in head. First ray $2\frac{1}{2}$ in head, twice length of last; fin base contained $1\frac{2}{3}$ in head. Second anal spine nearly as long as third, which is one-third of head length.

First ray, $2\frac{1}{2}$ in head, twice length of last, fin outline slightly concave, its base, including spines $1\frac{1}{8}$ in head. Pectoral somewhat sharp, its length $1\frac{2}{3}$ in head. Ventrals short, 2 in head, extending slightly over halfway to anal insertion. Anus halfway between anal spines and tip of ventral. Caudal deeply forked, lobes acute.

Color in alcohol uniform, silvery on sides and below, somewhat darker above. Dorsals margined with black, caudal tipped on both lobes, with oblique stripes from base of outer rays to tips of inner, and a median one along whole length of central two rays. Peritoneum dense black.

The young of this species was seen by Doctor Jordan in a tide pool at Misaki, besides the specimens above mentioned from Tanegashima, an offshore island of southern Japan. We have compared the types of *Kuhlia arge* with this species, and we are sure that no difference exists.

This species, unlike most others of the family, is strictly marine, living outside the coral reefs, the young entering tide pools among the rocks.

Kuhlia xenura Jordan and Gilbert, described from specimens alleged to come from Salvador, seems to be the same as *Boulengerina sandvicensis* (Steindachner) (*Kuhlia malo*, var. *sandvicensis*) from Hawaii.

(*τανία*, ribbon; *ὄψα*, tail.)

2. Genus KUHLIA Gill.

Kuhlia GILL, Proc. Acad. Nat. Sci. Phila., vol. 13, 1861, p. 48 (*ciliatus*).

Moronopsis GILL, Proc. Acad. Nat. Sci. Phila., vol. 15, 1863, p. 82 (*marginatus*).

Paradules BLEEKER, Ned. Tijd. Dierk., vol. 1, 1863, p. 257 (*marginatus*).

Type.—*Perca ciliata* Kuhl and Van Hasselt.

Body oblong, much compressed; head compressed; mouth short, oblique; maxillary without supplemental bone, relatively long, 2 to $2\frac{1}{2}$ in head; lower jaw projecting; no canines; the teeth subequal; pre-orbital sharply serrate; angle of preopercle without strong spine. Gill-rakers slender, about 9+18 in number, smaller and fewer than in *Boulengerina*. Pseudobranchiæ large. Scales moderate, not very rough; lateral line distinctly arched in front; top of head naked. Dorsal fin deeply notched, but not divided to base, with 10 slender spines; caudal lunate; anal spines graduated, the fin relatively short and high. Coloration bright silvery, mottled with dark olive, the peritoneum silvery, or spotted with brown. Tropical Pacific, the species inhabiting clear streams and pools at the foot of waterfalls, with the habit of the American black bass.

(Named for Kuhl, a naturalist, associate of Van Hasselt, and the discoverer of the typical species in the streams of Java.)

2. *KUHLIA MARGINATA* (Cuvier and Valenciennes).

DOKUGYO (poison perch).

Dules marginata CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 116, pl. 3 (Java).—BLEEKER, Sumatra, Nat. Tidj. Ned. Ind., vol. 3, 1852, p. 573, (Padang).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 268, (Java, Amboyna; Fiji); Fische Südsee, 1873, p. 24 (Sumatra, Java, Amboyna).—DAY, Fishes India, 1875, p. 67, pl. 18, fig. 1 (seas of India).

Paradules marginatus BLEEKER, Ned. Tidj. Dierk., vol. 1, 1863, p. 257.

Kuhlia marginata BOULENGER, Cat. Fish. Brit. Mus., 2d ed., vol. 1, 1895, p. 38 (New Guinea, etc.).—PERUGIA, Ann. Mus. Civ. St. Nat. Genova, ser. 2, vol. 16, 1896, p. 48.—JORDAN and EVERMANN, Fishes Formosa, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 340 (Kotosho).—ISHIKAWA, New and Little Known Fish., Proc. Dep. Nat. Hist. Tokyo Imp. Univ., vol. 1, 1904, p. 9, pl. 3, fig. 1 (Wadamura and Tojingawa, Idzu, Japan).—JORDAN and RICHARDSON, Bull. U. S. Bur. Fish., vol. 27, 1908, p. 233 (Aparri, Mindoro, P. I.); Fish. Formosa, Mem. Carnegie Mus., vol. 4, 1909, No. 4, p. 183; Check List P. I. Bur. Sci. Publ., No. 1, Manila, 1910, p. 25.

Dules maculatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 7, 1831, p. 475 (Celebes).—?BLEEKER, Nat. Tijds. Ned. Ind., vol. 5, 1853, p. 33 (Amboyna), (said to be different from *Dules marginata* Cuvier and Valenciennes).

Dules malo HOMBRON and JACQUIMOT, Voy. Pôle Süd. Dumont d'Urville, Poiss., 1846, pl. 3, fig. 4 (not of Cuvier and Valenciennes).

Moronopsis ciliatus BLEEKER, Arch. Neerl. Soc. Holl. Sciences, Harlem, vol. 7, 1872, p. 376 (Java, Bali, Sumatra, Nias, Celebes, Batjan, Buro, Amboyna, Ceram), (composite species?).—BLEEKER, Atlas Ichth., vol. 7, p. 120, pl. 316, fig. 1; pl. 324, fig. 2 (localities as above), (not of Kuhl and Van Hasselt).

?*Dules ciliatus* MACLEAY, Proc. Linn. Soc. N. S. Wales, vol. 7, 1882, p. 237 (New Guinea), (=“*marginatus*, *maculatus*, *malo*.”).

Dules papuensis MACLEAY, Proc. Linn. Soc. N. S. Wales, vol. 8, 1883, p. 257 (New Guinea, Goldie River).

Dules species? ISHIKAWA, Prel. Cat. Tokyo Imp. Mus., vol. 1, 1897, p. 55 (Wadamura, Izu, Japan).

Habitat.—East Indian, Chinese, and Japanese Seas.

Description of a specimen from Kotosho, Formosa, 138 mm. in total length; 7 from Apia, Samoa, the longest 145 mm.; 2 from Mindoro, Philippine Islands, 210 and 140 mm. in length; that from Formosa described in particular. Measurements include lower jaw.

Head $3\frac{1}{2}$ in body length; depth $2\frac{5}{8}$; eye $3\frac{1}{2}$ in head; maxillary $2\frac{1}{2}$; snout $3\frac{3}{4}$; interorbital space $3\frac{1}{3}$; D. X, 11; A. III, 11; scales in lateral line 42, in transverse series $5\frac{1}{2}$ –8 between insertions of dorsal and anal; gill-rakers on lower limb of first arch 16; branchiostegals 6.

Body symmetrical on upper and lower outlines, evenly arched; body not much thinner ventrally; depth of caudal peduncle $2\frac{2}{5}$ in head, its length $1\frac{2}{3}$ in head. Tip of snout at level of center of eyes; nostrils nearer tip of snout than center of eye; maxillary ending under anterior half of pupil; length of mandible half that of head, ending below center of eye. Preorbital coarsely serrate, its teeth directed more backwards than in *K. rupestris*. Preopercular margin more finely serrate, vertical edge slightly emarginate, horizontal one

straight, the angle slightly produced. Opercle with two stout spines. Teeth bristle like, on vomer, in $\wedge$ -shaped band, on jaws and palatines in narrow bands, that on upper jaw several times as broad as that of lower jaw, which is in two or three series.

Dorsal spines stiff, fifth contained $1\frac{1}{2}$ in head; the penultimate 3 in head, last 2; longest dorsal ray 2 in head, first not extending beyond base of last when supine; fin outline truncate, base of soft dorsal $1\frac{3}{4}$ in head. Soft anal base slightly longer than that of soft dorsal; third anal spine $2\frac{3}{4}$ in head; first soft ray extending to base of seventh. Pectoral $1\frac{1}{2}$ in head. Ventrals extending to anus, $1\frac{1}{2}$ in head. Caudal forked, rather deeply, inner rays slightly more than half length of outer, measuring from last scales, but two-thirds from last vertebra.

Color in alcohol somewhat silvery below lateral line, much darker above, frequently in irregular spots. Soft dorsal and anal narrowly edged with white, black submarginally; spinous dorsal edged with black; caudal dark, edged with darker. Peritoneum silvery, spotted with brown.

This species is nearest allied to *Kuhlia rupestris*, another river species from the same regions. It varies principally in a shorter maxillary, shorter head, mandible, number of transverse series of scales below the lateral line, form of soft dorsal, anal, of caudal, and in more spotted peritoneum. In all these characters and in physiognomy it approaches slightly to *Boulengerina*.

Our Formosan specimen and the two from Mindoro, Philippine Islands, correspond very closely, save for a somewhat shorter first anal spine, longer soft dorsal base, and wider spread opercular spines in the former. Since the number of specimens we have is so small, it is very likely that these are individual variations. The Formosan specimen has the first anal spine 0.055 of body length to last vertebra; soft dorsal base 0.2; and spread of opercular spines 0.05. The Samoan specimens have one more scale above and one more below in transverse series, and gill-rakers 8 to 10 + 22 to 24 (instead of 8 + 15 to 17).

The synonymy of this species, now current and given in part above, is nearly worthless because of the great probability of variation in these fresh-water fishes from island to island. There are at least two species included in Boulenger's *Kuhlia marginata*, and it is very probable that there are more. The Samoan specimens, at least, are not identical with those here described. We have no Japanese specimens of this fish. A memorandum of Doctor Jordan refers to a specimen from Izu, in the Imperial Museum in Tokyo. This is mentioned by Ishikawa as "*Dules* sp."

(*marginatus*, edged.)

2. Family PRIACANTHIDÆ.

The CATALUFAS.

Body oblong or ovate, compressed, covered with small, firm, rough scales; all parts of the body and head, even the snout and maxillaries, being densely scaly, each scale with a more or less developed plate on its posterior border, most developed in the young. Head deep. Mouth large, very oblique, the lower jaw prominent. Villiform teeth on jaws, vomer, and palatines, none on the tongue. Premaxillaries protractile. Maxillary broad, without supplemental bone, not slipping under the very narrow preorbital, which is usually serrate; no suborbital stay. Eye very large, forming about one-half the length of the side of the head. Posterior nostril long, slit-like, close to the eye. Preopercle more or less serrated, one or more strong spines at its angle; operculum very short, ending in two or three points behind; no barbels. Gill membranes separate, free from the isthmus. Pseudobranchiæ very large, extending along whole length of opercle. Postorbital part of head very short, the opercle small. Gills 4, a slit behind the fourth. Gill-rakers long. Branchiostegals 6. Lateral line continuous, not extending on the caudal. Dorsal fin continuous, its rays X, 9 to 15, the spines depressible in a groove; anal rays III, 9 to 15, the soft part long, similar to the soft dorsal, the spines strong; ventrals very large, thoracic, I, 5, close together, in advance of base of pectoral, joined to belly by a membrane which incloses a groove; no axillary process; spine strong; pectorals small, pointed, not symmetrical, of 19 or 20 rays, the upper longest; caudal fin truncate or lunate. Spines of fins generally rough with small serræ. Air bladder large. Pyloric cœca few. Vertebrae in reduced number, 9 or 10 + 13 = 22 or 23, the first vertebra being very small or absent; transverse processes beginning on the seventh (sixth) vertebra, the last 2 precaudals bridged across; ribs attached to the transverse processes; epipleurals absent on the last three precaudal vertebrae. Supraoccipital crest very low, continued forward to over front of orbit, where it is joined by the parietal crests; processes of premaxillaries moderate. Carnivorous fishes of the tropical seas, chiefly in deep waters; mostly rose-colored in life. The family is a sharply defined group, not close to any other, but the affinities on the whole seem to be nearest to the Serranidæ and their tropical allies. Genera 2, species about 10.

Key to genera.

- a*¹. Scales very small, 80 to 100 in lateral line; body oblong, its depth not half its length; preopercle with a flat spine; dorsal and anal each with 12 to 15 soft rays *Priacanthus*, 3.
*a*². Scales large and very rough, 35 to 50 in lateral line; body ovate, its depth more than half its length; preopercle without spines; dorsal and anal each with 9 to 11 soft rays *Pseudopriacanthus*, 4.

3. Genus **PRIACANTHUS** (Cuvier) Oken.

Les Priacanthes CUVIER, Règne Animal, 1817, p. 281 (*macrophthalmus*).

Priacanthus OKEN, Isis, 1817, p. 1783 (same type).

Type.—*Anthias macrophthalmus* Bloch (= *Sciæna hamrur* Forskål).

Scales very small, 80 to 100 in the lateral line; body oblong, more than twice as long as deep; preopercle with a spine at angle; interorbital area externally transversely convex, the cranium itself transversely concave, the elevation being formed of flesh; a conspicuous foramen in the interorbital area; lateral line extending upward and backward from upper angle of gill opening toward second dorsal spine, below which it changes its course, following outline of back to end of dorsal fin, thence direct to middle of caudal; anal fin rather long, its rays about III, 14; dorsal rays about X, 14. Species rather numerous in the tropical seas.

(πρίων, saw; ἄκανθα, spine; some of the fin spines being serrated.)

Key to genera.

- a*¹. Scales in transverse series above lateral line 9 to 11; posterior nostrils not widely open; tenth dorsal spine not more than twice length of second, not three-fifths of head; scales 97–100; anterior margin of preopercle covered with scales.
1. Dorsal rays X, 14 or 15; anal rays III, 14 or 15; depth of body about equal to head; preopercular spine weak and lobes of caudal slightly produced in adult.
hamrur, 3.
- b*². Dorsal rays X, 12 or 13; anal rays 111, 12 to 14; depth greater than head; preopercular spine strong; lobes of caudal not produced in adult . . . *macracanthus*, 4.
- a*². Scales in transverse series above lateral line 20 to 22; posterior nostrils widely open; tenth dorsal spine more than twice length of second, at least three-fifths of head; dorsal rays X, 12; anal rays 111, 12; scales 87 to 93; anterior margin of preopercle not covered, serrated *japonicus*, 5.

PRIACANTHUS HAMRUR (Forskål).**BAKAKINME** (fool gold eye).

Sciæna hamrur FORSKÅL, Descr. Anim., 1775, p. 45 (Djidda, Red Sea).

Anthias hamrur BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 307 (after Forskål).

Lutjanus hamrur LACÉPÈDE, Hist. Nat. Poiss., vol. 4, 1802, pp. 178 and 209.

Priacanthus hamrur CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 104 (Lohaia).—RÜPPELL, N. W. Fische, 1835, p. 95 (Red Sea).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 219 (Red Sea).—KLUNZINGER, Syn. Fische Roth. Meer., Verh. z. b. Ges. Wien, vol. 20, 1870, p. 708 (part).—BLEEKER, Ned. Tijd. Dierk., vol. 4, 1873, p. 176 (Java, Sumatra, Batu. Celebes, Sangi, Ternate, Batjan, Buro, Amboyna) (part); Atlas Ichth., vol. 7, 1876, p. 13, pl. 353, fig. 3 (after Ned. Tijd. Dierk., vol. 4).—STEINDACHNER and DÜDERLEIN Beitr. Fische Japan's I, Denkschr. Akad. Wiss. Wien, vol. 47, 1883, p. 239 (Tokyo).—KLUNZINGER, Fische Roth. Meer., 1884, p. 17.—DAY, Fauna India, Fish. vol. 1, 1889, p. 482.—SAUVAGE, Poiss. Madag., 1891, p. 125 (Amboyna).—MACLEAY, Proc. Linn. Soc. N. S. Wales, vol. 7, 1883, p. 235 (New Guinea).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 83.—SEALE, Fishes South Pacific, Bishop Mus., vol. 4, No. 1, 1906, p. 38, fig. 12 (Shortland Island, Solomons).—JORDAN and SEALE, Fishes Samoa, Bull. U. S. Bur. Fish., vol. 25 (1905),

1906, p. 261.—EVERMANN and SEALE, Bull. U. S. Bur. Fish., vol. 26 (1906), p. 78, 1907 (Bulan P. I.).—JORDAN and RICHARDSON, Bull. U. S. Bur. Fish., vol. 27, 1908, p. 257 (Calayan); Check List, P. I. Bur. Sci. Publ., No. 1, Manila, 1910, p. 27.

Anthias macrophthalmus BLOCH, Ichthyologia, 1792, pl. 319 ("Japan").

?*Priacanthus speculum* CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 7, p. 471, 1831 (Mahe).—VALENCIENNES, in Cuvier, Règne An. Illust. Poiss., 1836, pl. 11, fig. 1.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 221 (after Cuvier and Valenciennes).—PLAYFAIR, Proc. Zool. Soc., 1867, p. 850.—SAUVAGE, Poiss. Madag., 1891, p. 117, pl. 14, fig. 2 (Bourbon Island, Seychelles).

Priacanthus dubius TEMMINCK and SCHLEGEL, Fauna Japonica, 1842, p. 19 (Nagasaki).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 221 (after Temminck and Schlegel).

Priacanthus japonicus BLEEKER, Nat. Tijds. Ned. Ind., vol. 2, 1851, p. 171 (Siboga, East Sumatra), (not of Cuvier and Valenciennes).

Priacanthus blochii BLEEKER, Batavia, Nat. Tijds. Ned. Ind., vol. 4, 1853, p. 456 (Batavia, Siboga) (part).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 218 (Moluccas, Amboyna).—DAY, Fishes India, 1875, p. 48.

?*Priacanthus schlegelii* HILGENDORF, Sitzungb. Ges. Nat. Freunde, 1879, p. 79, Tokyo.

Habitat.—Coasts of Asia, occasionally northward to Japan.

Description after Boulenger, as we have no Japanese specimens.

Head $3\frac{1}{4}$ to $3\frac{1}{2}$ in total length; depth 3 to $3\frac{1}{2}$; eye $2\frac{1}{3}$ to $2\frac{1}{2}$ in head without mandible; snout one-half to two-thirds diameter of eye; interorbital space $3\frac{1}{2}$ to 4 in head; D. X, 14–15; A. III, 14–15; scales above lateral line 100–120; in lateral line 75–80; in transverse series 9–11–38–46; gill-rakers 18 to 23 on lower limb of first arch.

Spine at angle of preopercle short, indistinct in old specimens. Dorsal spines gradually increasing in length to the last, which is $1\frac{1}{2}$ to $1\frac{3}{4}$ as long as second and one-half to three-fifths length of head; longest soft rays not much longer than longest spine; spines feebly spinulose in the young, merely striated in the adult; soft rays feebly spinulose. Pectoral one-half to three-fifths length of head. Ventral nearly as long as head, the spine three-fifths to two-thirds its length. Third anal spine as long as sixth or seventh (of the) dorsal; the spinules on the spines disappearing in the adult. Caudal crescentic in the adult; the lobes more or less produced. Scales spinulose. Red above, silvery beneath, the fins usually blackish toward the edge.

Total length, 360 mm.

Boulenger records specimens from Red Sea, Zanzibar, Seychelles, Ceylon, Madras, Amboyna, and Japan.

Our specimen from Calayan, Philippine Islands, shows these measurements: Head (including lower jaw) $3\frac{1}{4}$ in body length; depth $2\frac{1}{2}$ in body; maxillary 2 in head; snout 3 in head without mandible, or seven-eighths diameter of eye; scales in lateral line 72, in series above 97, in transverse between insertions of dorsal and anal 11–41. The difference in scales and in other regards may indicate a different species than that of Boulenger. His measurements and counts have a wide variation and it is quite possible that he includes more than

one species under the name of *Priacanthus hamrur*. It may be that the Japanese form should stand as *Priacanthus dubius* Temminck and Schlegel, or, better, as *Priacanthus macrophthalmus* (Bloch), as Bloch's specimens were reported to come from Japan.

The black ventral spot supposedly characteristic of *Priacanthus dubius* is also found in the East Indian fish, and there are no direct measurements available by which we can judge of its depth, which is said to be greater. It may be that more than the single species is found in both Japanese and East Indian Seas, but we have no facts which will justify a separation or division of the current synonymy.

The changes which this fish undergoes with age seem to be rather marked, if they are not attributable to a confusion of two species. The caudal is first truncate, then becomes very crescentic, the lobes much produced, and the spine on the preopercle much shorter in the adult. The body loses its transverse bands of color, if it ever possessed them. Sauvage describes a specimen 8 inches long with truncate caudal and long spine, and other authors figure specimens with caudal emarginate. *Priacanthus schlegeli* of Hilgendorf has a truncate caudal, long spine, and transverse bands, leading one to believe it a young specimen of *P. hamrur*. However, he gives the head as much shorter, and the depth greater. His description is translated as follows:

Br. 6, D. 10/14, A. 3/15, L. 1. ca. 85, L. tr. /44. Depth $2\frac{3}{4}$ times in length (with caudal). Head $3\frac{3}{8}$ in body length; diameter of eye $2\frac{1}{8}$ in head; length of snout over one-half eye diameter; interorbital breadth two-thirds eye diameter. Preopercle with a long flat spine, extending over the subopercle; posterior and lower borders forming a large blunt angle, both thickly and finely toothed, the vertical intramarginal border entirely buried by scales. Opercle with two weak spines. Fourth dorsal spine longest. Caudal truncate. Scales ctenoid. Red with five dark crossbands. Ventrals black. (Museum of Berlin, No. 10599.)

This species is referred by Doctor Boulenger to the synonymy of the American species, *Priacanthus cruentatus*. This is doubtless incorrect, as the ventrals in the latter are not black, and the scale count does not correspond, although this, as well as the fin-ray count, may be due to different methods of enumeration.

It has not been recorded by any later authors.

4. PRIACANTHUS MACRACANTHUS Cuvier and Valenciennes.

BENIMEBARU (red pop-eye); KINME (gold eye).

Priacanthus macracanthus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 108 (Amboyna).—BLEEKER, Verh. Bat. Gen. Kunst. Wet., vol. 22, 1849, p. 48 (Batavia).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 220 (Japan).—CASTELNAU, Proc. Linn. Soc. N. S. Wales, vol. 3, 1878, p. 369 (Port Jackson).—SAUVAGE, Poiss. Madag., 1891, p. 125 (part).—ISHIKAWA, Prel. Cat. Tokyo Imp. Mus., vol. 1, 1897, p. 55.—BOULENGER, Cat. Fish. Brit. Mus., 2d ed., 1895, p. 354 (Japan, Formosa, off Banda, Arafura Sea, Port Jackson).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 358, 1901 (Toyko); Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 83 (Yokohama).

Priacanthus benmebari TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 19, pl. 7, fig. 1 (Japan).—RICHARDSON, Ichth., China and Japan, 1846, p. 237.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 218 (Japan); Ann. and Mag. Nat. Hist. (3), vol. 20, 1867, p. 57 (Sydney).—NYSTRÖM, Jap. Fisksaml., K. Svenska Vet. Akad., vol. 13, 1887, Afd. 4, No. 4 (Nagasaki).—GÜNTHER, Challenger Rep., Zool., vol. 1, pt. 6, 1880, p. 39 (Arafura Sea).

Priacanthus bleckeri, CASTELNAU, Proc. Zool. Soc. Victoria, vol. 2, 1873, p. 100 (according to Boulenger).

Priacanthus hamrur BLEEKER, Atlas Ichth., vol. 7, 1876, p. 13 (part).—SAUVAGE, Poiss. Madag., 1891, p. 125 (part).

Habitat.—Australian, East Indian, and Japanese Seas.

Description of two specimens from Tokyo and Nagasaki, respectively 163 and 305 mm. in total length. Head measurements include lower jaw.

Head $3\frac{1}{4}$ in body length; depth of body $2\frac{3}{4}$; eyes $2\frac{3}{4}$ in head; maxillary $2\frac{1}{5}$; snout $3\frac{1}{3}$; interorbital space 4; D. X, 13; A. III, 14; scales in lateral line 75–78, above 97–103, below 76–80, in transverse series between insertions of dorsal and anal 10 or 11/36; gill-rakers 3 or 4 + 21.

Breadth of body two in its depth, depth of caudal peduncle two-thirds of eye diameter. Interorbital space but very slightly arched, bone width one-half eye diameter. Gular space much swollen, produced as rounded ridge below borders of dentaries. Nostrils not open widely, but valved. Preopercle with strong flat spine at angle, its tip reaching junction of sub- and interopercles, and usually single; its base usually two-fifths to one-half of its length, which is 4 in eye. Posterior margin of preopercle serrate throughout, and on lower side of spine, but not on upper. Subopercle and interopercle entire, as well as anterior edge of preopercle. Opercle with one short blunt spine and an upper point. Teeth minute in $\wedge$ shaped band on vomer, in narrow bands on palatines, a single row on jaws.

Dorsal spines long, flexible, spinulose on alternate sides, fitting into groove when supine; second two-thirds of length of last, which is 2 in head. Dorsal rays soft, spinulose on both sides; first eight or nine of equal length, $1\frac{1}{8}$ in head, last reaching but halfway to end of caudal peduncle. First anal spine two-thirds of length of third, which is contained $2\frac{1}{3}$ in head; anal rays $1\frac{1}{8}$ in head. Pectoral $1\frac{3}{8}$ in head. Ventrals equal to head; their spines $1\frac{1}{2}$ in head; tip of rays reaching second anal spine, spinulose on lower side, the innermost attached to body by membrane. Base of spinous dorsal contained $2\frac{1}{3}$ in body length; of soft dorsal $4\frac{1}{6}$; of anal $2\frac{1}{9}$. Caudal nearly truncate.

Scales roughly ctenoid, hard to the touch, broad, bases three pronged, present over whole of head save lips, absent on all fins.

Color of alcoholic specimens uniform yellowish silvery, apparently red in life. Membranes of ventrals with a few much faded spots. The vertical fins are said to be spotted in life with olive brown.

This species is not very common in southern Japan. Our specimens are from Tokyo and Nagasaki. It is close to *Priacanthus cruentatus* of the West Indies, but the latter species has rougher spines. The types of *Priacanthus macracanthus* came from Amboyna, and it may possibly be that the Japanese species, *Priacanthus benmebari* Temminck and Schlegel, is really different.

(μακρός, long; ἄκανθα spine.)

5. PRIACANTHUS JAPONICUS Cuvier and Valenciennes.

CHIKAMEKINME (near-sighted gold eye).

Priacanthus japonicus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 106, pl. 50 (Japan).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 20 (Nagasaki).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 217 (Japan).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, I, Denkschr. kais. Akad. Wiss. Wien., vol. 47, 1882, p. 239, and Beitr. II, vol. 48, 1883, pl. 1, fig. 1 (Japan).—ISHIKAWA, Prel. Cat. Tokyo Imp. Mus., vol. 1, 1897, p. 55 (Tokyo Market).

Priacanthus supraarmatus HILGENDORF, Sitzungb. Ges. Nat. Freunde, 1879, p. 79 (Japan).

Priacanthus boops STEINDACHNER and DÖDERLEIN, Reise Aurora, Ann. Nat. Hofmus. Wien., vol. 11, 1896, p. 198 (Inland Sea of Japan).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 83 (Yokohama).—BOULENGER Cat. Fish. Brit. Mus., 2d ed., vol. 1, 1895, p. 357 (part from Japanese and Chinese Seas, not synonymy), (not *Anthias boops* Forster).

Habitat.—Coasts of southern Japan.

Described from two specimens 235 and 290 mm. in total length from Bingo in Kiusiu, one 210 mm. from Misaki, and one 280 mm. from Tokyo. All head measurements including lower jaw.

Head $2\frac{3}{4}$ in body length; depth 2 or $2\frac{1}{4}$; eye $2\frac{1}{4}$; maxillary $2\frac{1}{2}$ or 2; snout $3\frac{1}{2}$; interorbital space two-thirds eye diameter; D. X, 12; A. III, 12; scales in lateral line 56, above 87–93, below 75, in obliquely transverse series between insertions of dorsal and anal 20 to 22/45; gill-rakers 6 + 18; branchiostegals 7.

Body deep, width $2\frac{3}{4}$ in depth; profile straight from tip of lower jaw to insertion of dorsal, arched most strongly along bases of soft dorsal and anal. Depth of caudal peduncle two-thirds of eye diameter. Tip of lower jaw produced in a prominent knob. Interorbital space but slightly arched. Posterior nostril widely open, its width one-third of its length; anterior nostril small, posterior edge flapped. Suborbital bones coarsely serrated on both edges; preopercle serrated somewhat less coarsely on both margins, its anterior marginal ridge serrated, not covered by scales, spine not extending as far back as does interopercle; opercle not serrated, its spine not pointed but serrated at tip; sub- and interopercle finely toothed, as is whole exposed margin of shoulder girdle. Teeth small, pointed, in two rows in both jaws, lacking at premaxillary symphyses, and in three or four rows at the mandibular; in vomer in a $\wedge$ shaped band; on palatines in narrow bands.

Dorsal spines strong, not flexible, spinulose on alternate sides but only at base; length gradually increasing to last, which is twice the second and contained $1\frac{2}{3}$ in head. First dorsal ray $1\frac{1}{2}$ times as long as tenth spine and equal to head; other rays abruptly shortening from third, leaving fin acutely angular, its point reaching to base of caudal in well-developed specimens, but always to last scales in adults. Anal spines similar to dorsal, third twice the first, and half length of head. Soft anal similar to soft dorsal but not as long, its first rays $1\frac{1}{3}$ in head. Both dorsal and anal rays spinulose on both sides. Pectorals $1\frac{1}{8}$ in head, spinulose on outer base. Ventrals reaching to first or second ray of anal, length equal to head plus one-third eye, their spines $1\frac{1}{2}$ in head; spines and rays spinulose below. Caudal truncate.

Scales hard, finely toothed, present everywhere save on fins and lips. A row of modified scales present on upper edge of premaxillary and on anterior bordering membrane of eye. Scales of snout and lower jaw much modified, thick, rough, and hard. Bases of scales truncate.

Color in alcohol uniform; evidently red above and silvery below. Membranes of dorsal and ventral fins black, others colorless. Peritoneum silvery.

This species is moderately common on the coasts of southern Japan. We have it from Bingo, Misaki, and Tokyo.

Priacanthus supraarmatus of Hilgendorf is said to have "D. A. und V. schwarz," but differs in no other regard.

From Günther's *Priacanthus boops* (= *P. macropus* Quoy and Gaimard), *P. japonicus* differs in a larger eye and greater depth, judging by the description; and according to Sauvage, also in the form of the scale, which is truncate across the basal end in *P. japonicus*, while it is three-pointed in *P. boops*. From *P. alticlarens*, our fish differs in the much less prominent opercular spine, greater depth and larger eye, judging from the figure by Sauvage of that species.¹ It seems entirely probable that *P. japonicus* has not yet been observed south of the Chinese Seas, nor in the Atlantic Ocean, although Boulenger has identified it with *Priacanthus boops* (Forster) of the South Atlantic, and *P. alticlarens* (Valenciennes) from Bourbon, near Madagascar. We have no material for comparison.

4. Genus PSEUDOPRIACANTHUS Bleeker.

Pseudopriacanthus BLEEKER, Versl. kon. Akad. Wet. Amst., (2), vol. 3, 1869, p. 241 (*niphonius*).

Type.—*Priacanthus niphonius* Cuvier and Valenciennes.

Scales large, very rough, 35 to 50 in the lateral line; body broad, ovate, not twice as long as deep; preopercle with 2 small spines at

¹ Poiss. Madag., p. 127, pl. 16, fig. 3.

angle; interorbital space broad and flat, there being little flesh between skin and skull; posterior free edge of cheek above edge of preorbital serrated; post-temporal and scapular bones strongly serrate; eye very large; preopercular spine obsolete; no foramen in interorbital area; lateral line changing its course below the fourth dorsal spine; middle dorsal spines longest; anal short, its rays III, 9 to 11; dorsal X, 11. Otherwise essentially as in *Priacanthus*, the species living in deeper water.

($\phi\epsilon\upsilon\delta\acute{\eta}\varsigma$, false; *Priacanthus*.)

6. PSEUDOPRIACANTHUS NIPHONIUS (Cuvier and Valenciennes).

KURUMADAI (wheel porgy); KINKODAI (little gold porgy).

Priacanthus niphonius CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 107 (Japan).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 21, pl. 7A (Nagasaki).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 217 (Japan).—BLEEKER, Verh. kon. Nat. Ver. Neder., Ind., vol. 8, 1860, p. 73 (Japan).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, I, Denkschr. kais. Akad. Wiss. Wien, vol. 47, 1883, p. 239 (Tokyo, Oshima).

Pseudopriacanthus niphonius BLEEKER, Versl. kon. Akad. Wet. Amst., (2), vol. 3, 1869, p. 241 (Japan); Atlas Ichth., vol. 7, 1876, p. 14, pl. 350, fig. 5, and 354, fig. 3 (Japan).—BOULENGER, Cat. Fish. Brit. Mus., 2d ed., 1895, p. 358 (Japan; Manado, Celebes).—JORDAN and SNYDER, Check List, Ann. Zool. Japan, vol. 3, pts. 2 and 3, 1901, p. 83 (Yokohama).

Priacanthus meyeri GÜNTHER, Proc. Zool. Soc., 1871, p. 656, pl. 67 (Manado, Celebes).—SAUVAGE, Bull. Soc. Philom., (7), vol. 6, 1882, p. 168; Poiss. Madag., 1891, p. 131.

Habitat.—Japanese Seas, recorded once from Celebes, in East Indian Seas.

Description after Boulenger, of a specimen 275 mm. long.

Head $2\frac{1}{2}$ to 3 in total length; depth 2 to $2\frac{1}{4}$; snout one-third to one-half diameter of eye; eye $1\frac{1}{8}$ to 2 in head without mandible; interorbital width 3 to $4\frac{1}{2}$ in head; D. X, 11 or 12; A. III, 10 or 11; scales in lateral line 34–40, in series above 55–59, in transverse series 5 or 6/30 to 34; gill-rakers on lower part of first arch 17.

Dorsal originating above base of pectoral; spines strongly striated, middle longest two-thirds to three-fourths length of head and as long or longer than longest soft rays. Pectoral three-fifths to two-thirds length of head. Ventral about three-fourths length of head; second and third anal spines nearly equal, as long as tenth dorsal; caudal rounded. Color red above, silvery beneath; the soft fins edged with blackish; young with dark crossbands.

Steindachner and Döderlein say that their specimens had 48 to 52 scales above the lateral line, and that the ventrals reached usually to the anal insertion. According to the plate given by Temminck and Schlegel, the young have black dorsals and anals.

This rare species of the deeper waters of Japan was not seen by us.

Boulenger identifies *Priacanthus refulgens* of Sauvage with this species, but a transverse scale count of 8/24 is given, the eye is as

long as the snout, and the figure¹ shows an entirely different fish, as can easily be seen by a comparison with Günther's figure of the type of *Pseudopriacanthus meyeri* (Celebes) and the excellent figures of Temminck and Schlegel. It is worthy of note that the present species has been found but once beyond the waters of Japan, namely, in Celebes. Günther's figure of this specimen corresponds exactly with those of Temminck and Schlegel.

(*Nippon* or *Nippon*, the native name of Japan, which word is a corruption of *Nippon*.)

3. Family THERAPONIDÆ.

Body oblong, covered with moderate or small scales. Mouth moderate, with villiform teeth, the outer sometimes enlarged; those on the vomer and palatines deciduous or wanting. Maxillary slipping beneath the preorbital. Branchiostegals 6. Preopercle serrated; opercle with one or two strong spines; preorbital entire or serrate. Dorsal fin notched, with 12 or 13 stout spines. Anal spines 3, strong. Air bladder divided into two parts by a constriction. Pyloric cæca in moderate number. Carnivorous fishes of the tropical seas, referable to two genera. The family, here provisionally adopted, differs from *Hæmulidæ* in having the aid bladder constricted, and externally in having deciduous teeth on the vomer, and in having the opercle, as in the *Serranidæ*, armed with spines.

5. Genus THERAPON Cuvier.

Terapon CUVIER, Règne Animal, vol. 1, ed. 1, 1817, p. 295 (*servus*), (error of transcription for *Therapon*).

Pelates CUVIER, Règne Animal, vol. 1, ed. 2, 1829 (*quinquelineatus*).

Therapon CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 125 (*servus*).

Datnia CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 138 (*datnia*).

Pterapon GRAY, Indian Zoology, about 1835 (emendation for *Terapon*).

Mesopristes BLEEKER, Atlas Ichth., no description.

Eutherapon FOWLER, Journ. Acad. Nat. Sci. Phila., 1904, p. 527 (*theraps*; scales 55.)

Type.—*Holocentrus servus* Bloch.

This genus includes those *Theraponidæ* in which the teeth in the jaws are simple, villiform, or conic. In some species (*Eutherapon*) the scales are rather large. In some (*Pelates*, *Datnia*), the snout is more or less prolonged and the dorsal undivided.

(*θεράπων*, a slave; suggested by the name *servus*.)

Key to species.

a¹. *Therapon*. Dorsal deeply divided; the last spine much longer than the penultimate; teeth in outer row enlarged, wide set; opercle with a strong spine.

¹ Poiss. Madag., pl. 5, fig. 5.

- b*¹. Snout short; gill-rakers 8+13; scales about 18-95-33; maxillary ending under pupil; bands on body 3 in number, curved, the convexity downward; spinous dorsal with a large black spot *servus*, 7.
- a*². *Pelates*. Dorsal fin not deeply divided, the last two spines subequal; teeth all villiform, the outer scarcely enlarged; opercular spines weak.
- b*². Snout produced; gill-rakers 8+13; peritoneum pale; scales 15-72-22; maxillary ending under nostrils; body bands straight, 4 strong and 4 alternating weaker ones; spinous dorsal broadly margined with black, no large spot present. *oxyrhynchus*, 8.

7. THERAPON SERVUS (Bloch).

YAGATAISAGI (arrow bass).

Holocentrus servus BLOCH, Ichthyologia, pl. 238, 1797, fig. 1 (Japan).

Grammistes servus BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 185 (Japan), (after Bloch).

Therapon servus ISHIKAWA, Prel. Cat., 1897, p. 55 (Wadamura, in Izu, Miyakojima.)

Therapon jarbua SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, 1907, p. 476 (Kochi).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, 1907, p. 495 (Okinawa).—JORDAN and RICHARDSON, Fishes of Formosa, Mem. Carnegie Mus., vol. 14, 1909, No. 4, p. 187 (Takao), (not *Sciæna jarbua* Forskål).

Habitat.—Coasts of Asia, north to Japan.

Description of 7 specimens from Kagoshima, Japan, ranging from 69 to 157 mm. in body length, the largest taken as typical.

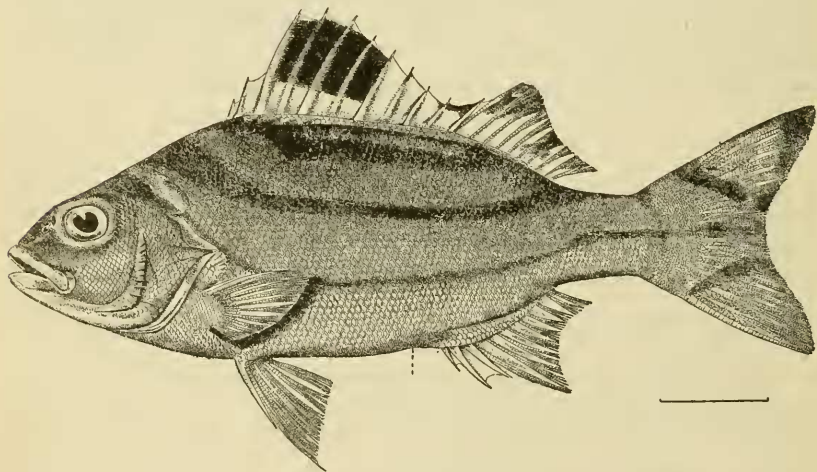


FIG. 1.—THERAPON SERVUS.

Head with spine 3 in length to last vertebra; depth $2\frac{2}{3}$; eye 5 in head with spine; snout $3\frac{1}{2}$; maxillary $2\frac{2}{3}$; least width of preorbital $8\frac{1}{2}$; D. X or XI, I, 10; A. III, 8 or 9; scales in longitudinal series¹ above lateral line 86 to 107 (usually 90 to 105); in longitudinal series below 83 to 93; in transverse to origins of dorsal and anal 17 to 20+30 to 34; gill-rakers 8+13; branchiostegals 6.

Snout somewhat arched in profile; interorbital space flat, narrowing quickly before eyes, ridged above temporal region; jaws equal,

¹ Those that run upward and backward.

maxillary ending under pupil. Preorbitals coarsely serrate on lower margin, their greatest width 7 in head. Preopercle toothed strongly at angle, less strongly above, three larger teeth at angle very acute in adults, longest less than half diameter of pupil. Serrations on lower limb abruptly smaller. Two opercular spines, the upper nearly obsolete, lower very strong, extending the distance of length of maxillary from hinder margin of preopercle. Clavicle with five coarse teeth, pointing back and upwards, of nearly same size as those of preopercle. Post-temporal serrated similarly to preorbital. Teeth in outer row conical, somewhat canine-like, not closely set, larger near middle of jaw; inner bands villiform, and smaller in size. Teeth on vomer and palatines present in young, but deciduous or few in number in adults.

Dorsals deeply divided; first spine very small, usually lacking in adults and much longer in the very young. Fourth and fifth spines longest, slightly less than two in head; penultimate three-fourths of eye diameter; last $4\frac{1}{2}$ in head, adnate to first ray, which is $2\frac{1}{4}$ in head. Second anal spine $3\frac{2}{3}$, third 4 in head, or equal to the second. First anal rays nearly twice length of third spine. Soft dorsal, anal, and caudal margins deeply concave. Pectorals short, 2 in head. Ventrals $1\frac{1}{2}$ in head, not reaching anus.

Scales small, roughly ctenoid, absent on inter- and preopercle, suborbital regions, snout and jaws. A temporal band of four or five series of scales present; a low sheath present along bases of dorsal and anal.

Body with three concentric black bands, first along bases of dorsals from first spines to first rays, leaving a clear space above in which lies a black streak from sixth to tenth dorsal spines; second from nuchal region to last dorsal rays, its upper edge passing through lateral line, but not below; third narrower, from occiput to middle caudal rays, fourteen scale rows below lateral band at its middle. A black blotch on spinous dorsal from fourth to seventh spines, another from ninth to eleventh or twelfth. First four soft rays tipped with black on distal halves, as are sixth and seventh, frequently a black spot present on last two rays. Caudal with central longitudinal stripe, an oblique band above and below, and upper lobe tipped with black. Other fins colorless. Peritoneum clear.

We have specimens of what is generally termed the same species from Formosa (2); Swatow, China (4); Samoa (2); Australia (2); Arabia (1); Manila, Cavite, and San Fabian, Philippine Islands (5); and Sumatra (1). Of these the Arabian specimen seems to be distinct in several respects. Its body bands are more convex, the upper nearly touching the lateral line, the second dropping four or five scales below the lateral line instead of as above. The maxillary ends under the anterior margin of the eye instead of the pupil; the body

depth is less for its size; the third anal spine is shorter, as is the anal base, the ventrals and ventral spine. Of the others, the Sumatran and Philippine specimens show only 80 to 83 scales in longitudinal series above the lateral line (90 to 105 in Japanese) and the size of the eye is greater than that of the Japanese, usually less than $4\frac{2}{3}$ in head. The Australian specimens correspond closely to the Japanese. The Samoan examples have slightly larger eyes and have the same scale counts as those of the East Indies. The Chinese and Formosan specimens correspond to the Japanese in scale counts, but have larger eyes, probably due in part to the smaller size of the specimens. The preopercular serrations of the East Indian fish are seemingly blunter than those of the Japanese. Outside of these characters no differences have been discovered in color or measurements. Since the scale counts differ so greatly, the Japanese species is probably not the same as that of the East Indies, Philippines, and Samoa, and is the same as the Formosan and Chinese form. The Arabian specimen must be taken as typical of *Sciaena jarbua* Forskål.¹ It should stand as *Therapon jarbua*, while the Japanese species is *Therapon servus*. We have specimens of this species from Kagoshima. Others from Izu and Miyakojima are in the Imperial Museum.

(*servus*, slave.)

Scale counts in longitudinal series above lateral line in *Therapon servus* and *Therapon jarbua*.

Number of scales.....	75.	80.	83.	86.	90.	95.	100.	105.
Japan (<i>servus</i>).....				1	1	1	2	2
China and Formosa (<i>servus</i>).....					1	3	2	
Australia (<i>servus</i>).....					1	1		
Samoa (<i>jarbua</i>).....	1	1						
East Indies (<i>jarbua</i>).....		2	4					

8. THERAPON OXYRHYNCHUS Temminck and Schlegel.

Therapon oxyrhynchus TEMMINCK and SCHLEGEL, Fauna Japonica, 1842, p. 16, pl. 6, fig. 3 (Nagasaki).—BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 64 (Japan).—RICHARDSON, Ichth. China and Japan, 1846, p. 239.—GÜNTHER Cat. Fish. Brit. Mus., vol. 1, 1859, p. 281 (Japan, China, India).—BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7 (Nagasaki, Shimoda).—STEINDACHNER and DÖDERLEIN, Beitr. II, Denkschr. kais. Akad. Wiss. Wien, 1883, p. 10 (Tokyo).—NYSTRÖM, Jap. Fisksaml., K. Svenska Vet. Akad., vol. 13, 1887, Afd. 4, No 4, p. 9 (Nagasaki).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 355 (Tokyo).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, 1907, p. 475 (Kochi, Matsushima Bay).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 78.

Habitat.—Seas of Japan, China, and India.

Description of numerous specimens from Shimiju, Suruga, Wakanaoura, Kagoshima, Nagasaki, Akune, Nagaoka, and Tokyo, Japan; and Swatow, China. Length from 60 to 195 mm.

¹ Descr. Animal, 1775, p. 50.

Head 3 to $3\frac{1}{2}$ in body; depth 3 to $3\frac{1}{2}$; maxillary 3 in head; longitudinal diameter of eye 5; snout $2\frac{1}{2}$; interorbital space $3\frac{2}{3}$ to $4\frac{1}{3}$; D. XII, 10; A. III 8. Scales above lateral line to base of caudal 72, below 60 to 70, with 51 pores, in transverse series between insertions of dorsal and anal 15/22 to 25; gill-rakers 8+15.

Dorsal and ventral contours of body similarly arched, the dorsal profile of head straight; snout conical, long, somewhat pointed; mouth small, maxillary ending before eye, under nostrils; lower jaw included; eye small, set rather low, leaving interorbital space convex from side to side; preorbital border serrated, that of preopercle at angle with strong teeth about one-fourth of eye diameter in length, diminishing in size above, with rather fine serræ on lower limb; opercle with two spines, the upper smaller than those on preopercle, the lower over half diameter of eye in length, flat and strong; clavicle set with teeth about half as long and strong as those on preopercle; post-temporal with much smaller teeth. Teeth in jaws small, conical, set in many rows anteriorly in both jaws and posteriorly in upper, but in two rows posteriorly in lower; outer rows only slightly larger, not closely set as in *Therapon quadrilineatus*; none on vomer, palatines or tongue. Gill-rakers short, stout, one-third of eye diameter in length.

Dorsals not deeply divided; spines strong; fourth, fifth, and sixth longest, $2\frac{1}{2}$ in head, last $3\frac{1}{2}$ in head, equal to the preceding spine; dorsal rays $2\frac{2}{3}$ in head, fin outline convex. Anal spines stout, second longest, $2\frac{2}{3}$ in head; first anal ray one-third longer, fin border straight. Pectoral small, $1\frac{1}{4}$ in head, slightly shorter than ventrals. Caudal short, 2 in head, concave.

Scales present everywhere on body save preorbital, dorsal surface of head, lips, and mandible. Dorsals and anal naked, save for a moderate sheath of scales; caudal scaled on basal half.

Colors somewhat variable in intensity, a specimen from Wakanoura almost black above and very dark below, others grayish silvery. Pattern constant, of four strong, longitudinal brown stripes, as broad as pupil, the third from snout, through eye to caudal, and of four fainter stripes alternating with these; all running down on snout, save that on middle of back and the lowermost; spinous dorsal with basal and distal bands, latter broader, former continued on soft dorsal; body bands not continued on caudal, which is irregularly mottled; other fins colorless. Peritoneum and gill cavities clear.

This species is very different from *Therapon servus*, and it should perhaps be placed in a different genus. It is, however, not closely related to the type of *Pelates*. This species is not rare on the coasts of southern Japan, as far north as Matsushima Bay.

A third species, *Therapon quadrilineatus* (Bloch), allied to *T. oxyrhynchus* and common in the East Indies, is mentioned by Bleeker as from "Japan." The record is probably from the Riu Kiu Islands.

The species has the gill-rakers 16 + 21, the scales 14–83–18, the bands on the body 4 in number and straight, the spinous dorsal with a large spot.

(ὀξύς, sharp; ῥογχός, snout.)

4. Family BANJOSIDÆ.

A small group of percoid fishes, allied to the Hæmulidæ, to the Serranidæ, and to the Histiopteridæ.

Body rather robust, covered with small firm scales. Mouth moderate, the maxillary mostly sheathed; outer teeth of jaws short and thick, the inner villiform; vomer with villiform teeth; no teeth on the palatines. Gill structures as in the Hæmulidæ. Dorsal fin deeply notched, the rays X, 12, the spines all very long, strong, and flattened; anal short, with three strong spines. Caudal slightly notched. Preopercle finely serrate; opercle and suborbital bones entire.

A single species of the seas of southeastern Asia.

6. Genus BANJOS Bleeker.

Anoplus TEMMINCK and SCHLEGEL, Fauna Japonica, 1842, p. 17 (no specific name; name preoccupied by *Anoplus* Schönherr, 1826, a genus of beetles).

Banjos BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7. (*typus*).

The characters of this genus are included above.

Type.—*Banjos typus* Bleeker = (*Anoplus banjos* Richardson).

(From the Japanese *Banzai*, signifying long life.)

9. BANJOS BANJOS (Richardson).

BANZAIDAI: CHOSENBAKAMA (Korean garment; a fish dressed in a Korean bakama or cloak).

Banjos Voy. de Krusenstern, pl. 54, fig. 1a.

Anoplus TEMMINCK and SCHLEGEL, Fauna Japonica, 1842, p. 17, pl. 8 (Nagasaki).

Anoplus banjos RICHARDSON, Ichth. China and Japan, 1846, p. 236 (after Temminck and Schlegel).

Banjos typus BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7, No. 112.

Anoplus banjos STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denkschr. kais. Akad. Wiss. Wien, 1883, p. 7 (Tokyo).—JORDAN and RICHARDSON, Fishes Formosa, Mem. Carnegie Mus., vol. 4, No. 4, 1909, p. 188 (Formosa).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901 p. 82 (Yokohama).—JORDAN and SNYDER, Proc. U.S. Nat. Mus., vol. 23, 1900, p. 357 (Tokyo).

Habitat.—Coasts of southern Japan and of China.

Described from a single specimen 225 mm. in length, collected at Tokyo by the U. S. Bureau of Fisheries steamer *Albatross*, recorded by Jordan and Snyder (1900).

Head 3 in body length, depth 2; eye $3\frac{1}{2}$ in head; snout $2\frac{1}{3}$; inter-orbital space (bone) $4\frac{2}{3}$; preorbital $3\frac{2}{3}$; D. X., 12; A. III, 7; scales

above lateral line 71, with pores 50; in transverse series between insertions of dorsal and anal, 13/32; branchiostegals 7; gill-rakers 5+14.

Body very deep, dorsal profile high, straight from snout to occiput, slightly arched to insertion of dorsal; base of spinous dorsal nearly straight, that of soft dorsal descending quickly to caudal peduncle, which tapers quickly in depth from the last dorsal ray. Ventral profile but slightly arched to anal base, which rises quickly to caudal peduncle. Mouth low; snout narrow, a trifle pointed; eyes large; interorbital space flat, with two low central ridges; nostrils small, close together, not far removed from eye; preorbital two-thirds as

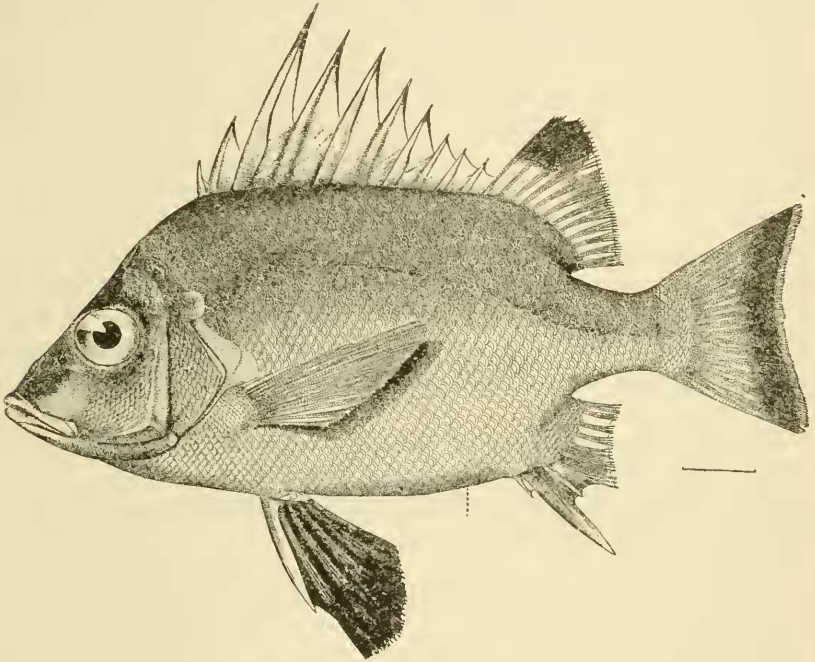


FIG. 2.—BANJOS BANJOS.

long as deep; maxillary ending under anterior border of eye, almost completely sheathed by preorbital. Preopercular margin forming a right angle, slightly concave on vertical margin near angle, very finely serrated on both. Opercle without spines, but one soft point present. Teeth in outer series of both jaws bluntly conical, of moderate size, and closely set, inner band three rows wide, of smaller but similar teeth. Vomerine teeth present, very short, thick and conical, almost molar. Gill-rakers short, thick, those on lower limb of first arch 8 in eye, those on upper only stubs.

Dorsals deeply divided; dorsal spines very large and strong, third longest, $1\frac{1}{2}$ in head, last short, $4\frac{1}{2}$ in head. Outline of spinous dorsal from third to last spine nearly straight. Longest dorsal ray $1\frac{1}{2}$ in

head. Anal spines very strong, second $1\frac{1}{2}$ in head, third weaker and shorter, $3\frac{1}{2}$ in head. Anal rays shorter than second spine, fin outline concave. Pectorals falcate, equal to length of head. Ventrals as long as head less one-half eye diameter, their spines two-third of their length, very strong. Caudal emarginate.

Scales not strongly ctenoid, present on bases of soft dorsal and anal, and in a sheath at base of spinous dorsal; absent on dorsal surface of head, preorbitals, and along margins of preopercle.

Color in alcohol uniform, olivaceous, darker above on body and head, the latter much more so. Spinous dorsal margined slightly with black; soft dorsal, anal, and caudal narrowly with white. First five rays of soft dorsal tipped with a black spot below white margin. Caudal submargined with black. Peritoneum and gill cavities clear.

Steindachner describes the color of the young as follows: Color whitish, with 7 or 8 broad dark longitudinal bands on the body, parallel to each other, and set with darker spots. On the caudal are three crossrows of spots, of which the middle row is smaller than the others and indistinct. The spots on the posterior row lie very close to the caudal margin, one very large, and deep blackish brown. A larger black spot is present between the three last dorsal spines and another white-margined one on the upper part of the first dorsal rays. The anal has one not very sharply margined between the second spine and third ray. Tips of the upper and lower rays of the caudal white. Ventrals deep black, pectoral yellow, with a dark spot at its base.

This species is rare in Japan and apparently not common anywhere. The specimen described was taken in the Tokyo market. We have later found it in abundance in the market of Osaka, and at Fusan, in Korea. It is known as Banzaidai.

5. Family HÆMULIDÆ.

The GRUNTS.

Body oblong, or more or less elevated, covered with moderate-sized, adherent scales, which are more or less strongly ctenoid or almost cycloid; lateral line well developed, concurrent with the back, usually not extending on the caudal fin; head large, the crests on the skull usually largely developed; no suborbital stay; mouth large or small, usually terminal, low and horizontal; premaxillaries protractile, their spines not greatly produced backward; maxillary without supplemental bone, for most of its length slipping under the edge of the preorbital, which forms a more or less distinct sheath; preorbital usually broad; teeth all pointed, none of them forming marked canines; no teeth on the vomer, palatines, or tongue; lower pharyngeals separate, with pointed teeth; gills 4, a large slit behind the fourth; pseudobranchiæ large; gill-rakers moderate;

gill membranes separate, free from the isthmus; preopercle serrate; opercle without spines; sides of head usually scaly; dorsal fin single, continuous or deeply notched, sometimes divided into two fins, the spines usually strong, depressible in a groove; the spines heteracanthous, that is, alternating, the one stronger on the right side, the other on the left, the spines 9 to 14 in number; anal fin similar to the soft dorsal, with 3 spines; ventral fins thoracic, I. 5, with a more or less distinct scalclike appendage at base; caudal fin usually more or less concave behind; air bladder present, simple; stomach cæcal; pyloric cæca few; vertebræ usually $10 + 14 = 24$. Branchiostegals usually 6 or 7. Cranium with its muciferous system moderately developed or rudimentary. Intestinal canal short. Carnivorous fishes of the warm seas, most of them valued as food. Genera about 12; species nearly 130. The group is very close to the Lutianidæ on the one hand and to the Sparidæ on the other, while some of its members show affinities with certain Sciaenidæ and Serranidæ.

Key to genera.

*a*¹. Chin without central groove.

*b*¹. PLECTORHYNCHINÆ. Preorbital scaly, its margin unarmed; soft parts of vertical fins scaly at base.

*c*¹. Dorsal without antrorse spine; chin without barbels; caudal emarginate or forked; scales small, over 100.

*d*¹. Gill-rakers rather long and slender, $7 + 11$; dorsal spines 14; preorbital narrow; body rather elongate; anal rays III, 8, the fin with a scaly sheath.

Parapristipoma, 7.

*d*². Gill-rakers short and thick, about $16 + 24$; preorbital broad; dorsal spines 9 to 12; body rather deep.....*Plectorhynchus*, 8.

*c*². Dorsal preceded by an antrorse spine; lower jaw with a tuft of small barbels or papillæ, the tip of snout papillate; caudal rounded; scales about 66; dorsal spines 11.....*Hapalogenyis*, 9.

*b*². SCOLOPSINÆ. Preorbital scaled; soft part of vertical fins naked; dorsal spines 10; scales large, about 38; gill-rakers very short and blunt, $6 + 5$.

*e*¹. Preorbital with a free posterior margin; a spine or other serrations on suborbital.....*Scolopsis*, 10.

7. Genus PARAPRISTIPOMA Bleeker.

Parapristipoma BLEEKER, Archiv. Neerl. Soc. Sci. Harlem, vol. 8, 1872, p. 4.

Type.—*Perca trilineata* Thunberg.

This genus is allied to *Plectorhynchus*, with which it agrees in lacking the central groove at the chin, characteristic of *Hæmulon*, *Pomadasis*, and their relatives. The body is relatively slender, covered with small scales. Dorsal fin continuous, with 13 or 14 rather slender spines. Anal III, 8. Preorbital unarmed; preopercle with fine serræ. Snout and jaws scaly; soft parts of vertical fins scaly at base, the anal with a scaly sheath.

One species of the Japanese seas.

The South American genus *Isacia* Jordan and Fesler (*Isacia conceptionis*) is closely related, differing mainly in the long anal (III, 13), which has a slight scaly sheath.

(*παρά* near; *Pristipoma*, an allied genus properly called *Pomadasis*.)

10. PARAPRISTIPOMA TRILINEATUM (Thunberg).

ISAKI, ISSAKI, ISAGI.

Perca trilineata THUNBERG, Beskr. 2 nya Fiske, Kongl. Vet. Acad. nya Handl., vol. 14, 1793, p. 55, pl. 1, fig. 2 (Nagasaki, Japan).

Parapristipoma trilineatum BLEEKER, Arch. Neerl. Soc. Holl. Sci. Harlem, vol. 8, 1872, p. 4 (Kiusiu and China).

Pristipoma japonicum CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 288 (Japan).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 60, pl. 26, fig. 2 (southwest coast of Japan).—RICHARDSON, Ichth. China and Japan, 1846, p. 228 (China).—BLEEKER, Vierde Beitr. Verh. Kon. Nat. Ver. Neder. Ind. (Act. Soc. Reg. Scient. Ind. Neerl.), vol. 3, 1857, p. 14 (Nagasaki).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 303 (Chinese seas).—NYSTRÖM, Jap. Fisksaml., K. Svenska Vet. Akad., vol. 13, Afd. 4, 1887, No. 9, p. 9 (Nagasaki).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's II, Denkschr. kais. Akad. Wiss. Wien, vol. 48, Abth. 1, 1883 (Tokyo).

Diagramma japonicum BLEEKER, Nalez. Ichth. Japan, Verh. Bat. Gen., vol. 25, 1852, p. 31, pl. 17, fig. 1 (Japan).

Diagramma aporognathus REGAN, Ann. and Mag. Nat. Hist., ser. 7, vol. 16, 1905, p. 18 (Inland Sea of Japan).

Habitat.—Coasts of Japan and China.

Described from 35 specimens from Tokyo, Misaki, Enoshima, Wakanoura, and Nagasaki, from 30 to 295 mm. in length.

Head $3\frac{1}{2}$ in body; depth 3 to $3\frac{1}{3}$; eye 4 in head; maxillary 3; pre-orbital width $2\frac{3}{4}$ in eye; interorbital, 3 in head; snout equal to interorbital width; dorsal rays XIV, 17; A. III, 8. Scales above lateral line 106 to 115, below 85, between lateral line and spinous dorsal 12, between lateral line and anal 17; between insertions of dorsal and anal $\frac{1}{2}\frac{8}{4}$. Gill-rakers 16 + 24.

Dorsal profile more highly arched than ventral, that of head nearly straight; caudal peduncle $2\frac{1}{2}$ times as long as deep. Snout rounded, rather short; mouth strongly oblique, lower jaw slightly projecting; maxillary ending under anterior border of eye, not all sheathed by preorbital; eyes set low, leaving interorbital area high and arched. Teeth feeble, minute, present on jaws only, in a narrow band anteriorly, a single row posteriorly. Preopercle with fine serræ nearly same in strength as teeth. Opercle with spines almost lacking. Gill-rakers slender, their length half diameter of eye.

Dorsal spines flexible, low, first inserted over point of opercle; fourth, fifth, and sixth longest, $2\frac{1}{2}$ in head, last equal to eye. Dorsals not divided, rays not appreciably higher than last spine. Anal spines stout, long, third $2\frac{1}{3}$ in head, slightly shorter and weaker than the second, first very short, $2\frac{1}{2}$ in eye; first anal rays one-fifth longer than third spine, last one-half first; margin of fin straight. Pectoral

somewhat falcate, long, nearly equal to head, ventrals $1\frac{1}{2}$ in head. Caudal margin deeply concave, its angles sharp, its length slightly less than head.

Scales present everywhere, save on soft dorsal and anal, which are deeply sheathed, and on lips; a patch of scales on exposed portion of maxillary. Rows on body very oblique.

Color in spirits: adults nearly plain dark above, clearer below, with narrow stripes of darker following rows of scales, especially below lateral line. In young, three narrow clear lines as wide as pupil, cutting dark above axis of body; the second running from upper edge of eye along lateral line to upper part of caudal, the first running parallel, about midway to mid-dorsal line of body; the third from the point of opercle to middle of caudal sometimes merged into clear ventral color. These lines may persist in adults to some degree. Fins nearly as dark as body; dorsals edged with black. Peritoneum, gill, and mouth cavities clear. The body lines are variable according to preservation, and much less distinct with age. In life, dark gray, with dark streaks along the rows of scales; yellow shades on back, head, and the lower fins; dorsal spines yellow; caudal blackish. The yellow streaks distinct in the young, vanishing in the adult.

This species, known everywhere as "*Isaki*," is one of the common food fishes of Japan, taken daily at every port south of Tokyo. It was seen at Tokyo, Misaki, Enoshima, Wakanoura, and Nagasaki.

(*trilineatus*, marked with three lines.)

8. Genus PLECTORHYNCHUS Lacépède.

Plectorhynchus LACÉPÈDE, Hist. Nat. Poiss., vol. 3, 1801, p. 135 (*chætodonoides*).

Les Diagrammes CUVIER, Règne Animal, vol. 1, 1817, p. 280 (*diagramma*).

Diagramma OKEN, Isis, 1817, p. 1783 (*diagramma*).

Spilotichthys FOWLER, Journ. Acad. Nat. Sci. Phila., 1904, p. 528 (*radjabon*).

Type.—*Plectorhynchus chætodonoides* Lacépède.

Body oblong, compressed, the upper outline parabolic. Mouth small, horizontal, the jaws with villiform teeth. Preopercle serrate; suborbitals without spines or serræ; branchiostegals 6 or 7. Chin with pores, but with no central groove and with no barbels. One dorsal fin with 9 to 12 stout spines. Soft parts of vertical fins scaly at base. Anal spines 3. Caudal forked or emarginate. Snout and jaws not scaly. Scales small. Air bladder simple.

Species numerous, of the tropical Pacific. We here exclude the genus or subgenus *Euelatichthys* Fowler (*affinis*) with large scales and 14 dorsal spines.

(πλεκτός, joined together: ῥύγχος, snout.)

Key to species.

α¹. DIAGRAMMA. Dorsal rays about IX or X, 22; scales small, about 95 below lateral line; color dark, with white stripes, broken into spots and highly variegated in the young.....*pictus*, 11.

a². PLECTORHYNCHUS. Dorsal rays about XII, 16; scales moderate, about 65 below lateral line; color dark, with brown spots and streaks.....*cinctus*, 12.

11. PLECTORHYNCHUS PICTUS (Thunberg).

Perca picta THUNBERG, Kongl. Vet. Akad. Nya Handl., vol. 13, 1792, p. 141, pl. 5, fig. 1 (Nagasaki).

Grammistes pictus BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 190.

Lutjanus pictus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, 1803, pp. 687, 688.

Diagramma pictum CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 315 (Java, Pondicherry).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 62 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 227 (Hongkong).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 327.—DAY, Fishes India, 1875, p. 81, pl. 21, fig. 3.—SAUVAGE, Poiss. Madag., 1891, p. 513 (name only).

Plectorhynchus pictus BLEEKER, Ned. Tidj. Dierk., vol. 4, 1872, p. 298 (Sumatra, Nias, Pinang, Singapore, Bintang, Bangka, Java, Diuzend-insel, Bawean, Celebes, Batjan, Ternate, Ceram, Amboyna).—BLEEKER, Atlas Ichth., vol. 8, p. 24, pl. 329, fig. 4; pl. 333, fig. 2 (after above).—EVERMANN and SEALE, Bull. U. S. Bur. Fish., vol. 26 (1906), 1907, p. 84 (Bulan, Jolo).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 78.

Spilotichthys pictus JORDAN and SEALE, Bull. U. S. Bur. Fish., vol. 26 (1906), 1907, p. 22.

Perca pertusa THUNBERG, Kongl. Vet. Acad. nya Handl., vol. 14, 1793, p. 198, pl. 7, fig. 1 (Nagasaki).

Lutjanus pertusus BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 328 (after Thunberg).

Diagramma pertusum GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 321 (after Cuvier and Valenciennes).

Plectorhynchus pertusus JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 78 (after Thunberg).

Holocentrus radjabon LACÉPÈDE, Hist. Nat. Poiss., vol. 4, 1803, pp. 335, 374.—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., 1903, vol. 25 (Formosa).

Anthias diagramma BLOCH, Ichthyologia, 1797, pl. 320 (East Indies).

Grammistes diagramma BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 184.

Sparus diagramma SHAW, Zool., vol. 4, 1803, p. 440, pl. 65.

Diagramma punctatum RÜPPELL, Atlas Reise nörd. Afrika, 1828, p. 126, pl. 32, fig. 2 (Northern Red Sea) (Ehrenberg).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 302 (Java and Batavia).—QUOY and GAIMARD, Voy. Astrol. Poiss., 1834, pl. 12, fig. 2, p. 699 (Vanikoro).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1842 p. 60 (Nagasaki).—BLEEKER, Sciën. Verh. Bat. Gen., vol. 23, 1850, p. 25 (Batavia).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 323 (Red Sea, Ceylon, China).—KNER, Reise Novara Fisch., 1860, p. 54 (Java).—DAY, Fishes India, 1875, p. 83, pl. 21, fig. 4.—SAUVAGE, Poiss. Madag., 1891, p. 513 (name only).

Plectorhynchus punctatus BLEEKER, Atlas Ichth. Perc., 1875, pl. 22, fig. 1.—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 78.

Diagramma cinerascens RÜPPELL, Atlas Reise nörd. Afrika, 1828, p. 127 (Red Sea).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., 1830, vol. 5, p. 307 (Trincomalee).

? *Diagramma lineatum* RÜPPELL, Atlas Reise nörd. Afrika, 1828, p. 125 (Massaua).

? *Diagramma blochii* CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 312 (Trincomalee).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 329 (after Cantor), (East Indies).

Plectorhynchus blochii CANTOR, Cat. Malay. Fish, 1850, p. 77 (Pinang).

Diagramma pæcilopterum CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 314, (Pondicherry).—TEMMINCK and SCHEGEL, Fauna Japonica, 1842, p. 62 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 227 (Canton).—GÜNTHER, Cat. Fish. Brit. Mus., 1859, vol. 1, p. 329.

Plectorhynchus pæcilopterus JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 78.—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 349 (Keerun and Giran, Formosa).

Diagramma ocellatum (Kuhl and Van Hasselt) CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 303 (Java).

Diagramma balteatum (Kuhl and Van Hasselt) CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 316 (Java).

Plectorhynchus balteatus CANTOR, Cat. Malay. Fish, 1850, p. 78 (Singapore).

Diagramma centurio CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 308 (Seychelles).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 322 (after Cuvier and Valenciennes).—PLAYFAIR, Fish. Zanzibar, p. 127 (according to Bleeker).

Diagramma thunbergii CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 308 (locality uncertain).—BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 18, No. 121 (after Cuvier and Valenciennes).

Habitat.—Indian Ocean, Red Sea, Chinese and Japanese Seas.

Described from a series, 21 in all, from Manila and Cavite, Philippine Islands, from Formosa, and from Onomichi and Nagasaki, Japan; ranging from 32 to 200 mm. in body length.

Head 3 to $3\frac{1}{2}$ in body; depth $2\frac{1}{2}$; eye 4 in head; maxillary 3; pre-orbital width 4 to $4\frac{1}{2}$; interorbital width 4; snout $2\frac{1}{2}$; D. IX or X, 21 to 23; A. III, 6 or 7; scales above lateral line 110 to 122, below 84 to 95, between insertions of dorsal and anal 16 or 17/21 to 24; gill-rakers 7 + 11 or 12.

Dorsal profile of body much more strongly arched than ventral; greatest depth of body above pectoral fin, leaving space from snout to first spine very convex with a longer slope to the caudal. Snout low, its apex half the diameter of eye below latter's lower edge; inter-orbital space convex from eye to eye; maxillary ending under anterior border of eye; lips somewhat fleshy. Teeth in jaws villiform. Pre-opercle finely serrate. Opercle with two points. Post-temporal very finely serrate. Gill-rakers short, rather stout.

Dorsal spines highest in second, which is 2 in head or $2\frac{2}{3}$ in body depth (in adult); last spine two-thirds of second, equal to first soft ray. Dorsals not divided. Last rays longest, $1\frac{2}{3}$ in head. Anal spines of same strength as dorsal, second and third subequal, $2\frac{2}{3}$ to $3\frac{1}{2}$ in head, first very short, 7 in second; anal rays $1\frac{1}{2}$ times length of spines. Caudal truncate or somewhat emarginate. Pectorals $1\frac{2}{3}$ in head, ventrals $1\frac{1}{2}$.

Scales small, ctenoid, present everywhere save tip of snout, lips, maxillary and lower jaw. Preorbital scaled. A sheath present along spinous dorsal; bases of soft dorsal, anal and caudal covered.

Color of adult in alcohol uniform on body, with indications only of rows of brown dots half as large as pupil on flanks and upper surface. Dorsal and caudal fins with similar spots, dorsals bordered with black, first part of soft dorsal broadly. Anal and ventrals tipped with black. Peritoneum, mouth and gill cavities clear.

The changes which this fish undergoes during its life, particularly in color, are apparently very marked, and have given rise to much confusion and synonymy. The depth of the body becomes greater with age, ranging from 35 to 40 hundredths of the body length; the eye varies as usual; the dorsal spines become markedly lower in proportion, being two-thirds to three-fourths of the the body depth in the young and two-fifths in adult, ranging from 15 to 25 hundredths of body length; the caudal is elongate, equal to head, and pointed, with the outer rays much shorter than the central, while in the adult the caudal becomes emarginate and but two-thirds of head length. The anal spines also shorten, as do the gill-rakers. In color the young, 32 mm. in length, described as *D. pictum* and *balteatum*, etc., shows two very broad black stripes, so broad as to become the ground color of the upper part of the body. The first runs from the snout along the bases of the dorsals to the last rays, leaving an interrupted narrow white line in the center of the head and occiput and a spot at the base of the first dorsal ray. The second stripe, its width one-third of the body depth, runs through the eye to the lower caudal rays, leaving a narrow white stripe from above the eye to the upper caudal rays. Below the second black stripe the body is clear, but sometimes showing another indistinct dark band. The dorsals are black save for the first spine, and the margin and last rays of the soft dorsal. In later life the clear spot below the first spines spreads, splitting the first black stripe into two, the dark bands narrow and traces of still narrower ones appear below the pectorals; the dorsals are margined with black, with the body bands continued on them. At this stage the fish is about 100 mm. long, and has been described as *Diagramma blochii*, etc. The upper black line left by the splitting of the broad upper one then breaks into round spots, a row of which appears in the white stripe above the eye, and the previously indistinct dark lines below the lowermost broad line also break up into spots, extending to the cheeks. The membrane between the first three dorsal spines clears. This stage, 120 mm. long, has also been described as a separate species. From this on the tendency is to break up the stripes into round spots, leaving the dorsal margined with black. With age the spots disappear from the body leaving it uniform,

and are present only on the fins. This adult has been known as *Diagramma punctatum*.

We see no characters which would indicate that *Plectorhynchus pertusus* of Thunberg is a different species. The subgenus *Spilotichthys* Fowler, represented by this species, differs from typical *Plectorhynchus* in the smaller scales and few dorsal spines. This species is common along the coast of southern Japan. It was taken by us at Onomichi and Nagasaki.

(*pictus*, painted.)

12. PLECTORHYNCHUS CINCTUS (Temminck and Schlegel).

KOSHODAI (noble porgy).

Diagramma cinctum TEMMINCK and SCHLEGEL, Fauna Japonica, 1842, p. 61, pl. 26, fig. 1 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 226 (Canton).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 325 (China, Japan, Nepal).—BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 18, No. 117 (name only), (Japan, China).—NYSTRÖM, K. Svenska Vet. Akad., vol. 13 (Afd. 4), 1887, No. 4, p. 11 (Nagasaki).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's II, Denkschr. kais. Akad. Wiss. Wien., vol. 48, 1883, p. 11 (Tokyo).

Plectorhynchus cinctum BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7 (name only), (Kiusiu and Shikoku).

Plectorhynchus cinctus STEINDACHNER, Reise Aurora, Ann. Nat. Hofmus. Wien, vol. 11, 1896, Heft 2, p. 199 (Inland Sea of Japan).

Habitat.—Coasts of southern Japan and China.

Description of nine specimens, five half-grown from Yokohama, three adult from Wakanoura, and one from Misaki, ranging from 88 to 370 mm. in length.

Head 3 in body length; depth $2\frac{1}{4}$; eye 5 in head; maxillary 3; preorbital $4\frac{1}{2}$; interorbital $3\frac{1}{3}$; snout $2\frac{1}{2}$; D. XII, 15; A. III, 7. Scales above lateral line 94, below 65 to 70; in transverse series between insertions of dorsal and anal, $17\frac{1}{2}$. Gill-rakers 8 + 15.

Body deep, nuchal region high, arched from snout to insertion of dorsal, and less so from insertion to base of caudal. Interorbital space arched from eye to eye. Mouth low, its tip below lower border of eye by half diameter of latter. Jaws equal; maxillaries ending below or slightly before anterior margin of eyes; lips fleshy, maxillary well sheathed by preorbitals. Nostrils large, slit-like. Preopercular margin finely serrated. Opercle without spines, but with two obscure points. Teeth in jaws minute, bluntly conical, in narrow bands above and below; absent on vomer and palatines. Gill-rakers slightly pointed, short, one-fourth of eye diameter in length.

Dorsals deeply divided. Fourth spine longest, $1\frac{3}{4}$ to $2\frac{1}{4}$ in head, last 3 to 4. Longest dorsal rays $2\frac{1}{4}$ in head. Second anal spine longest, of equal strength with third, former 2 to $2\frac{1}{2}$ in head, latter 3. Pectoral short, $1\frac{3}{4}$ in head, pointed. Ventrals longer, $1\frac{1}{2}$ in head. Caudal truncate in adult, somewhat rounded in young.

Scales everywhere ctenoid, present on all of head save preorbitals, snout, maxillaries, and lips, extending well down over interorbital space, over bases of soft vertical fins and present as a low sheath at base of spinous dorsal.

Color of alcoholic specimens: a curved dark band extending from the nuchal region, just behind the pectorals to the anal fin, becoming faint distally; from the third to seventh spines of the dorsal another band describes a parallel arc which ends at the upper part of the caudal root, becoming narrower distally; and along the base of the soft dorsal a third much fainter, short band. These bands at their inception are about as broad as a third of the head length. Much deeper in color than the bands and distributed only through the region between the line of the back and the lower edge of the second band, are numerous spots, diminishing in size and intensity of coloration with age, scarcely larger than a scale in adults but as large as pupil in young. The dorsal and caudal fins are colored as is the body, save that the spots on the spinous dorsal are fewer and somewhat larger. The ventrals are usually tipped with black, the pectorals are colorless. Peritoneum, gill cavity, and mouth lining colorless.

This species is not rare on the southern coasts of Japan. Our specimens are from Misaki, Yokohama, and Wakanoura.

(*cinctus*, banded.)

NOTE ON ANOMALODON BOWDITCH.

A genus of this family, *Anomalodon* Bowditch (Fishes of Madeira, 1825, p. 237), allied to *Plectorhynchus* and to *Pomadasis*, has been overlooked by recent writers. It has the dorsal notched, and its rays, D. XI, 15; A. III, 10. The species *Anomalodon incisus* Bowditch may be the same as *Pristipoma bennetti* Lowe (D. XII or XIII, 16; A. III, 11 or 12) or perhaps *Pristipoma rogeri* Cuvier and Valenciennes (D. XII, 15; A. III, 10) or *Pristipoma peroteti* Cuvier and Valenciennes (D. XI, 17; A. III, 10). The genus *Anomalodon*, if with a chin groove, should differ from *Orthopristis* by the notched dorsal. If without chin groove, *Anomalodon* should be compared with *Isacia* (*conceptionis*), and with *Parapristipoma*.

9. Genus HAPALOGENYS Richardson.

Hapalogenys RICHARDSON, Ann. Mag. Nat. Hist., vol. 13, 1844, p. 463 (*nitens*).

Type.—*Hapalogenys nitens* Richardson = (*Pogonias nigripinnis* Schlegel).

Body compressed, elevated, covered with moderate ctenoid scales. Mouth moderate, horizontal. Chin with several pores, hidden by a mass of short crowded barbels or papillæ, these little developed in the young; no central groove. Tip of snout naked, with small papillæ. Teeth small, uniform. Preopercle serrate. One dorsal, with eleven

strong spines, an antrorse spine before it. Soft parts of vertical fins scaled at base. Caudal rounded. Air bladder simple.

This genus differs from *Plectorhynchus* mainly in the tuft of small barbels at the chin, inconspicuous in the young, and in the antrorse dorsal spine. The few species belong to the warm parts of Asia.

(ἀπαλός, soft-haired; γένυς chin.)

Key to species.

- a¹. Nostrils small, nearly midway between eye and tip of snout; eyes moderate; second anal spine short, 3 to 4 in head; vertical fins very dark, the spinous dorsal edged with black; peritoneum and gill cavity pale.....*nigripinnis*, 13.
- a². Nostrils large, close to eye; eye large; second anal spine long, 2 to 2½ in head.
 - b¹. Outline of spinous dorsal straight or concave from third to last spine; dorsal fin pale, margined narrowly with black; peritoneum and gill cavity black.
mucronatus, 14.
 - b². Outline of spinous dorsal rounded; vertical fins black.....*kishinouyei*, 15.

13. HAPALOGENYS NIGRIPINNIS (Temminck and Schlegel).

HEGEDAI (bearded porgy).

Pogonias nigripinnis TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 59, pl. 25 (Nagasaki).

Hapalogenys nigripinnis GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 317 (Chinese Seas).—STEINDACHNER, Reise Aurora, Ann. Nat. Hofmus. Wien, vol. 11, 1896, Heft 2, p. 198 (Kobe, Hiogo, or Nagasaki).—STEINDACHNER and DÜDERLEIN, Beitr. Fische Japan's, II, Denkschr. kais. Akad. Wiss. Wien, vol. 47, 1883, p. 10 (Tokyo).

Hapalogenys nitens RICHARDSON, Ann. and Mag. Nat. Hist., vol. 13, 1844, p. 463; Voyage Sulphur, 1846, p. 84, pl. 43, figs. 1, 2 (Canton).

Hapalogenys maculatus RICHARDSON, Ichth. China and Japan, 1846, p. 235 (Canton).—BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857 (Nagasaki).

Habitat.—Coasts of southern Japan and China.

Description of three adult examples 196, 220, and 275 mm. long and two young 30 and 69 mm. in length, the former from Wakanoura and the latter from Tsuruga.

Head 2½ to 2¾ in body; depth 2; eye 5½ in head; maxillary 2¾; snout 2½, preorbital width 4; interorbital 4½; D. XI, 15; A. III, 9. Scales in lateral line 48, above 66, below 56; in transverse series between insertions of dorsal and anal, 11 or 12/20. Gill-rakers 6 + 14.

Body very deep, mouth very low, nearly in line with ventral profile, which is almost straight from jaw to anal fin. Dorsal profile straight, or somewhat concave before eyes from snout to recumbent spine of dorsal; then strongly arched; descending more gradually to root of caudal. Snout blunt, rounded; interorbital space high in adults; nostrils somewhat farther from snout than from eyes, of moderate size. Mouth large, horizontal; jaws equal; maxillary ending under anterior half of eye; lips somewhat fleshy, papillose; lower jaw more distinctly so, but not well bearded in our examples.

Preopercular angle produced backward somewhat, its margins finely serrated. Opercle with two small inconspicuous flat spines. Teeth in jaws only, bluntly conical, minute, largest in external rows.

Dorsal deeply divided; last dorsal spine one-fifth of fourth, which is longest and 2 in head; spines strong, a stout procumbent one present anteriorly. Spinous dorsal outline rounded, not concave. Rays slightly longer anteriorly, $2\frac{1}{2}$ in head. Anal spines stout, second longest and strongest, 4 in head, third 6; third ray longest, $2\frac{1}{3}$ in head. Pectorals short, broad, their length contained $1\frac{5}{8}$ in head. Ventrals about equal to pectorals. Caudal $1\frac{2}{3}$ in head, its margin rounded.

Scales roughly ctenoid, lacking before nostrils on snout and jaws, replaced by papillate skin; present on exposed portion of maxillary, at bases of soft anal and caudal, and in low sheath at base of spinous dorsal, not extending on soft dorsal or anal, save as a minute row on each side of rays and of dorsal spines.

Color of alcoholic specimens nearly uniform, but showing traces of dark bands much as in *Plectorhynchus cinctus*, that is, a rather narrow one from the nuchal region, down through the area behind the pectoral and back in a long arch to the lower part of the caudal peduncle; another parallel to the first from the first dorsal spines to the upper part of the caudal peduncle; and a third below the soft dorsal. Fins all dark, without pattern. A young specimen shows a clear caudal; first dorsal margined with black, and second dorsal and anal with colorless edge. Peritoneum, gill and mouth cavities clear. The young specimens have a very much flatter interorbital, eye 4 in head.

Günther regards *Hapalogenys maculatus* as a doubtful synonym of *H. nigripinnis*,¹ and we see no reason to question this, especially as our alcoholic specimens have nearly lost the bands which Richardson regarded as characteristic of *H. maculatus*. Steindachner found no procumbent spine in his example, but in our largest specimen this was more deeply buried in the flesh than in the others, and his specimen was twice as large (41 cm.).

This species is rather common in southern Japan. We have examples from Wakanoura and Tsuruga.

(*niger*, black; *pinna*, fin.)

14. HAPALOGENYS MUCRONATUS (Eydoux and Souleyet).

HEGEDAI (bearded porgy).

Pristipoma mucronatum EYDOUX and SOULEYET, Voy. de la *Bonite*, 1841, p. 161, pl. 2, fig. 1.

Hapalogenys mucronatus GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 318 (China).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denk-

¹ Cat. Fish. Brit. Mus., vol. 1, 1859, p. 317.

schr. kais. Akad. Wiss. Wien, vol. 48, 1883, p. 11 (Osaka).—NYSTRÖM, K. Svenska Vet. Akad., vol. 13, 1887, Afd. 4, No. 4, p. 9 (Nagasaki).

Hapalogenys analis RICHARDSON, *Voyage Sulphur*, 1846, p. 85, pl. 43, fig. 3; Ichth. China and Japan, 1846, p. 235 (Canton).

Habitat.—Coasts of southern Japan and China.

Description of numerous specimens from Kobe, Onomichi, and Hiroshima, ranging from 120 to 155 mm. in length.

Head $2\frac{3}{5}$, depth 2 in body length; eye $3\frac{1}{2}$, snout $2\frac{3}{5}$, preorbital $5\frac{1}{2}$, interorbital width, $3\frac{4}{5}$; maxillary $2\frac{1}{2}$ in head; D. XI, 15; A. III, 10. Scales above lateral line 67, below 59, with pores 47, in transverse series between insertions of dorsal and anal 10/26, in vertical transverse series 10/19. Gill-rakers 8+15.

Dorsal profile greatly arched, ventral very little; outline of head straight, or strongly concave just back of eyes, seemingly very variable in this regard; back strongly arched at insertion of dorsal, but slightly so until soft dorsal is reached, where it falls quickly to caudal peduncle. Interorbital region but slightly convex from eye to eye. Nostrils large, close to eye, anterior one much the largest, somewhat tubular, and with small flap posteriorly. Mouth large, maxillary ending under middle of eye, but little exposed, jaws equal. Preopercle serrate as in *H. nigripinnis*, post-temporal and clavicle serrated more finely.

Opercle with two obscure flat points of equal size. Teeth in jaws conical, pointed, regularly and closely arranged, of moderate strength, in four rows below and above, the inner three absent posteriorly.

Dorsals deeply divided, the last spine equal to diameter of pupil. Spines very strong, third longest, $1\frac{1}{4}$ in head in adult, outline of spinous dorsal slightly concave or straight, a procumbent spine present anteriorly. Longest dorsal ray $2\frac{1}{2}$ in head, outline of fin rounded. Anal spines strong, second much stronger and longer than third, their lengths being contained respectively $2\frac{1}{3}$ and 4 in head. Soft anal truncate or slightly rounded. Pectorals, ventrals, and caudals, $1\frac{2}{3}$ in head, nearly of equal length save for filaments on ventrals.

Scales roughly ctenoid, present on bases of vertical fins and a minute row extending along each side of both spines and rays half or two-thirds of the way to their tips. A sheath also present along base of spinous dorsal. Scales replaced on snout, lips, maxillary and lower jaws by papillæ, which are slightly longer on latter in adults.

Color on body in broad, transverse black bands, rather irregular, and variable. First band from first half of spinous dorsal and pectoral to ventrals as broad as length of head without snout; second band from soft dorsal narrowing ventrally; third band above anal. Vertical fins all margined narrowly with black; ventrals broadly so; pectoral clear. Peritoneum and gill cavity black, lining of mouth clear.

This species is fairly abundant in southern Japan. Our specimens are from Kobe, Onomichi, and Hiroshima.

(*mucronatus*, having a short, sharp point.)

15. *HAPALOGENYS KISHINOUEI* Smith and Pope.

Hapalogenys kishinouei SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, 1907, p. 476, fig. 6 (Urado). (Type, Cat. No. 55610, U.S.N.M.)

Habitat.—Coasts of southern Japan.

Having no specimens of this species, we reproduce the original description.

Head 2.6 in length; depth 2; eye 3 in head; snout 3.4; interorbital 4; dorsal XII, 14; anal III, 10; scales in lateral line 50; gill-rakers 11+5.

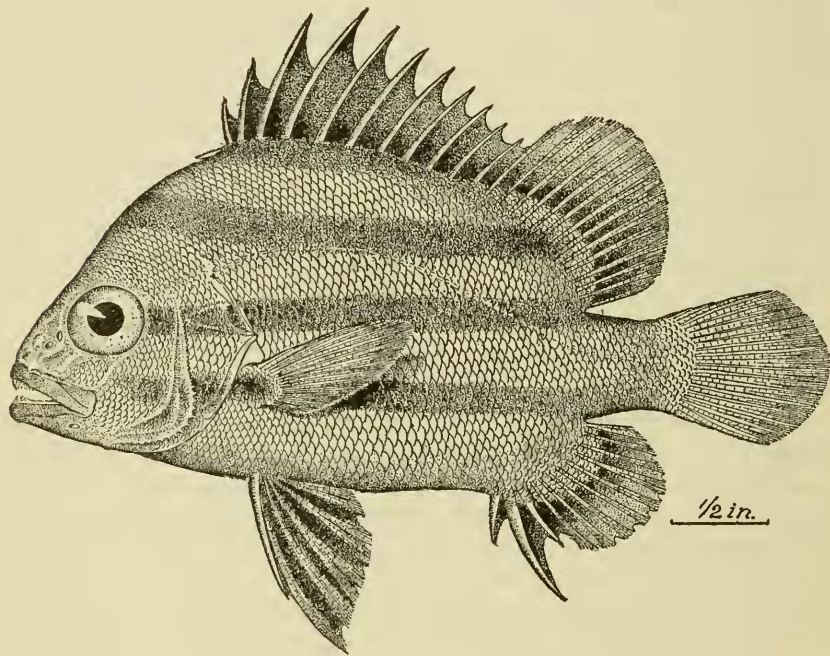


FIG. 3.—*HAPALOGENYS KISHINOUEI*.

Body short, high, much compressed; dorsal outline greatly arched, ventral outline nearly straight; caudal peduncle compressed, its least depth 3 in head; snout bluntly pointed; mouth moderate, horizontal, the jaws about equal; maxillary reaching to beyond anterior margin of pupil; jaws with villiform teeth, the anterior larger and sharply pointed; roof of mouth toothless, but lined with villiform membranes; symphyseal notch of upper jaw deep; 4 large pores on lower side of mandible; papillæ on mandible minute and close-set; gill-rakers short and thick; preopercle serrate, the denticulations much coarser at the rounded angle; opercle with 2 short spines, the lower the sharper; spinous dorsal preceded by a sharp procumbent spine a

little shorter than the first upright spine; all the spines strong, the fourth the longest and equal to distance from tip of snout to posterior rim of orbit, the remaining spines graduated; soft dorsal short and rounded, with finely scaled base; base of spinous dorsal about twice length of soft portion; anal short and rounded, similar to soft dorsal and preceded by 3 strong spines, of which the second, the longest, is 0.5 head; caudal rounded; ventrals with outer rays the longest; scales finely ctenoid; snout and chin naked; lateral line concurrent with dorsal profile. Color in alcohol silvery gray, with 4 reddish-brown horizontal bands, the first band running along the base of spinous dorsal, the second from midway between eye and origin of dorsal to middle of base of soft dorsal, the third from eye to end of soft dorsal at top of caudal peduncle, the fourth from cheek under eye to end of anal on caudal peduncle; dorsal, anal, and ventrals black; caudal and pectorals slightly dusky.

Described from a specimen 115 mm. long, collected by Dr. Hugh M. Smith, at Urado, May 10, 1903.

(Named for Kaminichi Kishinouye, Imperial Commissioner of Fisheries for Japan.)

10. Genus SCOLOPSIS Cuvier.

Scolopsis CUVIER, Règne Animal, ed. 1, 1817, p. 280 (le *Kurite* de Russell).

Scolopsides CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 327; same type.

Type.—*Scolopsides kurita* Cuvier and Valenciennes (= *Anthias japonicus* Bloch) a species not yet known from Japan.

Body oblong, symmetrical, covered with rather large ctenoid scales. Snout moderate, the mouth small, the jaws equal. Teeth small; chin without a central groove; no barbels. Preorbital naked, a more or less distinct spine hooked backward on the second suborbital; below this usually are one or more points. Preopercle sharply serrate. Branchiostegals 6, the last one very small. Dorsal rays X, 8. Anal rays III, 7. Vertical fins scaleless.

This genus is strongly distinguished from its relatives by the presence of a spine or hook on a suborbital bone, as also by the shorter and scaleless vertical fins. The species all belong to the East Indian region. From the related genus *Heterognathodon* it is distinguished by the suborbital spine, a character little developed in the Japanese species.

(σκόλοψ, a stake or sharp point for impaling.)

16. SCOLOPSIS INERMIS (Temminck and Schlegel).

TAMAGASHIRA (ball head).

Scolopsides inermis TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 63, pl. 28, fig. 1 (Nagasaki).—BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 83 (Nagasaki).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, 1907,

p. 477 (Kagoshima).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 33, 1901, p. 751 (Yokohama); (not of Richardson).

Scolopsis inermis GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 357 (after Bleeker).—BLEEKER, Atlas Ichth., vol. 8, 1876, p. 4, pl. 341, fig. 5 (Sangir; Nagasaki); Ned. Tijd. Dierk., vol. 4, 1873, p. 352.—STEINDACHNER, Beitr. Fische Japan's II, Denkschr. kais. Akad. Wiss. Wien, 1883, p. 14 (Kagoshima).—NYSTRÖM, K. Svenska. Vet. Akad., vol. 13, Afd. 4, 1887, No. 4, p. 13 (Nagasaki).

Heterognathodon guliminda ISHIKAWA, Prel. Cat. Tokyo Imp. Mus., 1897, p. 54 (Kagoshima) (not of Cuvier and Valenciennes).

Heterognathodon döderleini ISHIKAWA, Prel. Cat. Tokyo Imp. Mus., vol. 1, 1897, p. 10, pl. 4 (Kagoshima, same specimen as above).

Habitat.—Coasts of southern Japan.

Description of a specimen 153 mm. in body length from Nagasaki.

Head 3 in body; depth $2\frac{2}{3}$; eye $3\frac{1}{2}$ in head; interorbital space 4; snout $3\frac{1}{2}$; maxillary $2\frac{3}{4}$; D. X, 9; A. III, 7; scales in lateral line 36; in transverse series between insertion of dorsal and insertion of anal $3\frac{1}{2}/10$; gill-rakers 6 + 5; branchiostegals 6.

Dorsal profile slightly more arched than ventral. Snout conical; interorbital space slightly rounded, without raised edge of skin over eyes, broadening forward from center of pupil; edge of orbit not prominent anteriorly; preorbitals flat; jaws equal, maxillary ending under anterior margin of eye. Margin of second suborbital bone with four or five serrations posteriorly, the upper largest, somewhat spine-like, contained four or five times in pupil. Posterior suborbitals finely serrated on lower edges, the retrorse spine present in other species rudimentary or almost lacking. Preopercle finely and closely serrate. Opercle with a small blunt spine. Teeth in jaws small, bristlelike, largest in outer row, with a band of smaller villiform teeth behind. Gill-rakers short, blunt, with an accessory one on the ceratohyal.

Fourth dorsal spine highest, $2\frac{1}{4}$ in head; last spine 3 in head, nearly equal to the following ray. Longest dorsal ray $2\frac{1}{2}$ in head. Second and third anal spines equal, $2\frac{3}{4}$ in head, anal rays slightly longer, of nearly same length throughout. Soft dorsal and anal outlines not pointed, but truncate or slightly rounded. Ventrals $1\frac{3}{4}$ in head, their spines three-fourths of the ray length. Caudal forked, $1\frac{5}{8}$ in head.

Scales slightly ctenoid, not present on interorbital region, snout, suborbitals, jaws, or lower limb of preopercular margin. Those on cheek in four rows, on opercle in six.

Color of entire fish bright light red in life, with broad crossbands of deeper red. Alcoholic specimens clear yellow, slightly tinged with bronze above. Fins all clear and colorless save for a hint of darker spots on membrane of spinous dorsal. Peritoneum and gill cavity lining silvery.

We can see no distinguishing marks in the specimen described by Doctor Ishikawa as *Heterognathodon döderleini*, and the plate given corresponds very closely to our specimen and to the published descriptions of *Scolopsis inermis*.

This handsome fish is generally common in southern Japan. We saw it at Nagasaki. Another species, *Scolopsis bilineata* (Bloch), finely marked with a pearl-white stripe, occurs in the Riu Kiu Islands and may reach Japan. *Scolopsis japonica* Bloch is not yet known from Japan

(*inermis*, unarmed.)

6. Family SPARIDÆ.

The PORGIES or TAI.

Body oblong, or more or less elevated, covered with rather large, adherent scales, which are never truly ctenoid. Lateral line well developed, concurrent with the back, not extending on caudal fin. Head large, the crests on the skull usually largely developed. No suborbital stay. Mouth small, terminal, low, and horizontal. Pre-maxillaries little protractile; maxillary short, peculiar in form and in articulation, without supplemental bone, for most of its length slipping under the edge of the preorbital, which forms a more or less distinct sheath; preorbital usually broad, teeth strong, those in front of jaws conical, incisorlike or molar; lateral teeth of jaws conical and sharp or more or less blunt and molar; no teeth on vomer or palatines except in *Erynnis* and *Neolethrinus*, the former with a group on the vomer, the latter having the roof of the mouth with molar teeth; posterior nostril largest, usually more or less oblong or slitlike; lower pharyngeals separate; gills 4, a large slit behind the fourth; pseudo-branchiæ large; gill-rakers moderate; gill membranes separate, free from the isthmus; preopercle entire or serrulate; opercle without spines; sides of head usually scaly; dorsal fin single, continuous, or deeply notched, the spines usually strong, depressible in a groove; spines heteracanthous, that is, alternating, the one stronger on the right side, the other on the left; the spines 10 to 13 in number; anal fin rather short, similar to the soft dorsal, and with 3 spines; soft dorsal and anal fins naked; ventral fins thoracic, the rays I, 5, with a more or less distinct scalelike appendage at base; caudal fin usually more or less concave behind; air bladder present, usually simple; pyloric cæca few; vertebræ usually $10 + 14 = 24$; intestinal canal short. Carnivorous shore fishes of the tropical seas, especially abundant in the Mediterranean, Red Sea, and West Indies. Genera about 18, species about 115, most of them much valued as food.

Key to genera.

- a*¹. Front teeth of jaws conical, some of them canine, none of them incisorlike; second interhæmal bone normal, not pen-shaped.
- b*¹. LETHRININÆ. Cheeks naked; top of head naked; upper teeth of jaws laterally in a single series, conical or molar. Dorsal spines 10, body compressed. *Lethrinus*, 11.
- b*². SPARINÆ. Cheeks scaly.
- c*¹. Lateral teeth of jaws conical; no molar teeth.
- d*¹. Cheeks with three rows of large scales; body rather elongate; top of head scaly. Canines moderate, in upper jaw only; none of the dorsal spines filamentous; the spines not exerted beyond the membranes....*Euthyopteroma*, 12.
- d*². Cheeks with more than three rows of scales; body rather deeper.
- e*¹. Top of head naked; canines moderate; in both jaws; dorsal spines low, 10 in number.....*Gymnocranius*, 13.
- e*². Top of head scaly; limb of preopercle scaly; lateral teeth of jaws in one series, conical, not molar, and with a band of small granular teeth; canines strong in both jaws; dorsal spines low, 12 in number. *Taius*, 14.
- c*². Lateral teeth in jaws molar; upper molars in two or more series; top of head scaly; scales on cheeks in several rows.
- f*¹. Vomer with a few conical teeth in front; third and fourth dorsal spines elevated; molars in two series, preopercular limb naked; frontal bone spongy; supraoccipital crest extending well forward.....*Evynnis*, 15.
- f*². Vomer toothless.
- g*¹. Molars in two series; color crimson or yellowish; preopercular limb usually with some scales; parietal crests of cranium very low; supraoccipital crest not extending far forward; none of the dorsal spines elevated.....*Pagrosomus*, 16.
- g*². Molars in three or more series; parietal crests of cranium moderate; color olive silvery, preopercular limb naked. *Sparus*, 17.

11. Genus LETHRINUS Cuvier.

Lethrinus CUVIER, Règne Animal, ed. 2, 1829.

Type.—*Sparus chærorhynchus* Bloch and Schneider.

Body oblong, compressed, covered with rather large scales. Snout moderate (much prolonged in the allied genus *Lethrinella*); jaws with canine teeth in front; a single series laterally of conical or molar teeth. No teeth on vomer. Cheeks naked, top of head naked; preopercle naked. D. X, 9; A. III, 8. Dorsal spines low, their membranes somewhat notched. Pyloric cæca two or three; air bladder notched posteriorly, with short lateral appendages. Angle of mouth red within, as in *Hæmulon*.

Species numerous, largely of the East Indian seas. Superficially they resemble the species of *Lutianus*.

We separate as a new subgenus *Lethrinichthys*, those species without molar teeth, the type being *Lethrinus nematacanthus*.

(*λεθρίνος*, a name unexplained.)

Key to Japanese species.

- a*¹. *Lethrinichthys*. Lateral teeth of jaws conical, not molar.
- b*¹. Second dorsal spine filamentous, $1\frac{1}{2}$ in head. Six rows of scales above lateral line. Depth 3 in length *nematacanthus*, 17.
- b*². Second dorsal spine not elevated, longest dorsal spine $2\frac{2}{3}$ to 3 in head. Centers of the scales darker; vertical fins red in life. Five rows of scales above lateral line. Depth $2\frac{2}{3}$ in length..... *hæmatopterus*, 18.
- a*². *Lethrinus*. Lateral teeth of jaws distinctly blunt and molar.
- c*¹. Six rows of scales above lateral line. Depth $2\frac{1}{4}$ in length *chærorhynchus*, 19.

17. LETHRINUS NEMATACANTHUS Bleeker.

FUEFUKIDAI (flute-mouth porgy); **KUCHIBIDAI** (red-mouth porgy).

Lethrinus nematacanthus BLEEKER, Japan, Nat. Tijds. Ned. Ind., vol. 6, 1854, p. 403 (Nagasaki); Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 90, pl. 6; Ned. Tijds. Dierk., vol. 4, 1873, p. 327.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 456 (Louisade Archipelago).—BLEEKER, Atlas Ichth., vol. 8, 1877, p. 114, pl. 337, fig. 3 (Amboyna).—EVERMANN and SEALE, Bull. U. S. Bur. Fish., vol. 26, 1906, p. 86 (Bulan, Philippine Islands).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 80.

Habitat.—East Indies, north to southern Japan.

Description of five specimens from Wakanoura, two from Tokyo, the Imperial University, one from Bulan, Philippine Islands, and one from Moreton Bay, Australia. Body lengths varying from 110 to 163 mm.

Head $2\frac{5}{8}$ to 3 in body length; depth $2\frac{8}{9}$ to $3\frac{1}{2}$; eye $3\frac{1}{3}$ to $3\frac{1}{2}$ in head; snout $2\frac{1}{4}$ to $2\frac{1}{2}$; D. X, 9; A. III, 8; scales in lateral line 48, in transverse series to insertions of dorsal and anal fins 6/14; gill-rakers 4 to 6+6.

Dorsal and ventral profiles of body equally and evenly arched from snout to caudal. Upper profile of snout straight or slightly convex, never concave or with tip produced. Preorbital depth contained 3 to $3\frac{1}{2}$ in head; width of preopercle at angle about one-half eye diameter, its margin very flexible, the posterior one nearly vertical. Nostrils closer together than the posterior one is to the eye. Prefrontals more prominent than usual, the interorbital space broadening anteriorly, at its narrowest point somewhat less in breadth than the eye. Maxillaries ending under anterior margin of eye, well hidden by prefrontals, which cover their posterior halves, as well as the angle of the mouth. Jaws with a single row of rather large conical teeth, becoming smaller and more acute anteriorly, where they form a band behind the canines. These teeth more obtuse posteriorly, only those of the upper jaw blunt enough to be called molar. Lower jaw anteriorly with two canines on each side, the outermost pointing slightly back and outward in tusklike fashion. Upper jaw with two on a side. Canines varying, worn blunt and short in some specimens.

Dorsal spines weak, flexible; second filamentous, $1\frac{1}{2}$ in head in best preserved specimen; third about 2 in head; last spine a trifle longer than penultimate, $3\frac{1}{4}$ in head. Succeeding dorsal rays somewhat longer than last spine. Second and third anal spines equal in strength, third a little longer, 3 in head. Anal rays subequal, $2\frac{2}{3}$ in head. Pectoral reaching anus, $1\frac{1}{3}$ in head. Ventrals reaching first anal spine, somewhat shorter than pectorals.

Scales strongly ctenoid. Temporal band in a double row. Lateral line little arched, without strong bend at root of caudal.

Body with small irregular blotches on sides, arranged in very indistinct transverse stripes; a spot two-thirds the size of the eye, below seventh scale of lateral line. Dorsum of head dark, with an indistinct band between the eyes. Cheeks with small sinuate streaks of dark. Premaxillaries tipped with dark. Dorsal fin with three

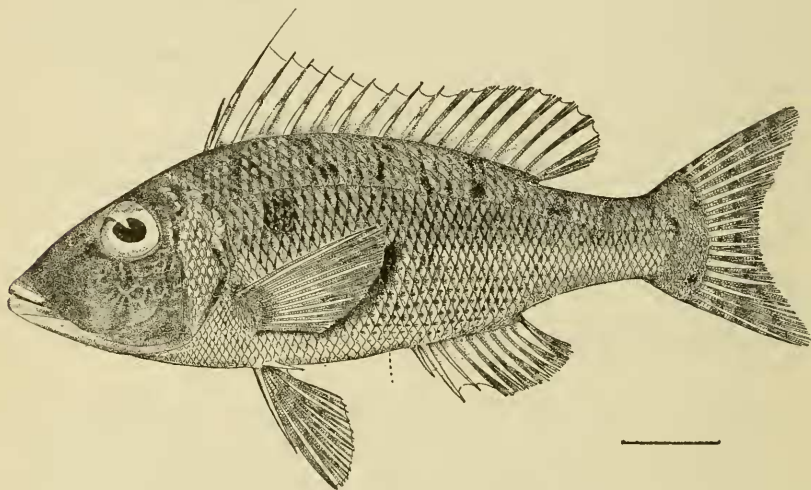


FIG. 4.—*LETHRINUS NEMATACANTHUS*.

rows of spots on spines, two on soft fins; caudal with five or six transverse bands of these spots, anal with one or two; ventrals with four or five; pectorals colorless. Color patterns badly preserved.

In life, olive green, with irregular dark bands and dull yellow spots. Cheeks vermiculate with pearly blue, a characteristic mark; angle of mouth red; fins barred with dull orange and yellowish.

This species is rather common in southern Japan. It was seen by us at Tokyo and at Wakanoura.

(*νημα*, thread; *ἄκανθα*, spine.)

18. *LETHRINUS HÆMATOPTERUS* Temminck and Schlegel.

ITOFUEFUKIDAI (thread flute-mouth porgy).

Lethrinus hæmatopterus TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 74, pl. 38 (southwest coast of Japan).—RICHARDSON, Voyage *Sulphur*, 1846, p. 144, pl. 64, figs. 1-3 (China).—BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26,

1857, p. 91 (Nagasaki).—KNER, *Reise Novara*, Fisch., 1860, p. 80 (Manila).—BLEEKER, *Revis. Lethrini*, Ned. Tij. Dierk., vol. 4, 1873, p. 323; *Atlas Ichth.*, vol. 8, 1877, p. 112, pl. 331, fig. 4 [Amboyna, Manila (Luzon)].—JORDAN and SNYDER, *Check List*, *Ann. Zool. Jap.*, vol. 3, pts. 2 and 3, 1901, p. 80 (Riu Kiu).—EVERMANN and SEALE, *Bull. U. S. Bur. Fish.*, vol. 26, 1907, p. 86 (Bacon, Philippine Islands).

Lethrinus richardsonii GÜNTHER, *Cat. Fish. Brit. Mus.*, vol. 1, 1859, p. 456 (China Sea).

Habitat.—East Indies, north to southern Japan and China.

Description of six specimens from Nagasaki, ranging from 112 to 195 mm. in body length.

Head $2\frac{3}{5}$ in body length, depth $2\frac{2}{5}$; eye $4\frac{1}{3}$ in head; snout 2; D. X, 9; A. III, 8; scales in lateral line 49; in transverse series between insertions of dorsal and anal $5/16$; gill-rakers 5+5.

Dorsal profile of body more arched than ventral, that of head straight from snout to occiput. Depth of preorbital $2\frac{4}{5}$ in head; width of preopercle at angle $1\frac{2}{3}$ in eye, its margin flexible, its posterior limb extending somewhat forward from vertical. Nostrils farther apart than the distance between the eye and the posterior one. Prefrontals not very prominent; interorbital region broadening but little, about 4 in head. Maxillary not entirely sheathed by preorbital, ending under anterior nostril. Teeth in jaws conical, in a single row, becoming smaller anteriorly, where a patch of bristlelike teeth lie behind the canines; no true molar teeth. Two canines on either side in both jaws, the outermost largest below.

Dorsal spines rather stout, none filamentous, third and fourth longest, $2\frac{2}{3}$ in head; last two of equal length, $3\frac{1}{3}$ in head. Dorsal rays a third longer than spines. Anal spines similar to those of dorsal, second $3\frac{1}{6}$ in head, third $3\frac{3}{4}$. Anal rays one-fourth longer than third spine. Pectorals $1\frac{1}{6}$ in head, reaching first anal spine. Ventrals $1\frac{2}{3}$ in head.

Scales roughly ctenoid. Lateral line moderately arched. Temporal band of scales double.

Color in alcohol uniform, save for the darker center of scales above the lateral line, a darker area at the root of the caudal, and indications of rows of spots on soft dorsal, anal, and ventrals. A young specimen shows an almost entirely faded black spot between the pectoral and lateral line, and by looking closely indications of this can be seen in the larger specimens.

In life, with dull orange crossbands and pale blue spots which fade at death, a dusky shoulder blotch; fins dull orange: inside of mouth with orange.

In the adults the eye is not as broad as the interorbital space, is contained twice in the snout, and the dorsal spines are shorter than in this young specimen. In the latter the eye is broader than the interorbital space and contained $1\frac{2}{3}$ in the snout. These would

cover the differences between *L. richardsonii* Günther and *L. hæmatopterus* Bleeker. The sharpness of the lateral teeth, size of the eye, and height of the dorsal spines are all age marks. Kner¹ is probably right in calling these one species.

This fish is rather common in southern Japan. We saw it in Nagasaki.

(αἷμα, blood; πτερόν, fin.)

19. *LETHRINUS CHÆRORHYNCHUS* (Bloch and Schneider).

Sparus chærorhynchus BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 278 (Japan).

Lethrinus hæmatopterus GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 469 (Sea of Japan), (not of Temminck and Schlegel).

Lethrinus güntheri BLEEKER, Arch. Neerl. Soc. Holl. Science, Haarlem., vol. 8, 1872, pp. 153-154, fig. (Kiusiu, Nagasaki).

Lethrinus richardsonii JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 350 (Keerun, Formosa), (not of Günther).

Habitat.—Southern Japan and Formosa.

Description after Bleeker, in the absence of a well-preserved specimen.

Head 3 in body, 4 in total length; depth $2\frac{4}{5}$ in body, $3\frac{1}{5}$ in total length; eye 3 in head; interorbital space 4; D. X, 9 or 10; A. III, 8 or 9; scales in lateral line 48; in transverse series 6/16 or 17.

Breadth of body $2\frac{1}{2}$ in its depth; head somewhat acute, its height equal to its depth; upper profile of head somewhat convex before eyes, slightly concave on snout; nostrils distant, anterior tubular, valved; snout little longer than eye; suborbital breadth a little less than eye diameter; jaws equal, maxillary ending before the eye, 3 in head; lower jaw $2\frac{2}{5}$ to $2\frac{1}{2}$ in head. Teeth in jaws in many series in front, laterally and posteriorly in one row; two curved canines in front of both jaws, moderate in size in upper, small in lower jaw; lateral series of about 12 teeth, anteriorly conical, acute or obtuse, posteriorly rounded molars. Lips fleshy; opercular spine indistinct.

Dorsal spines moderately stiff, middle ones longest 3 in depth of body; dorsal rays a little higher; pectorals longer than ventrals, a little shorter than head; anal spines moderate, second and third subequal, shorter than first ray, soft fin a little longer than high, convex, angulated posteriorly. Caudal moderately emarginate, lobes acute, slightly shorter than head.

Color of body above olivaceous, below golden; iris yellow or reddish; fins reddish or yellow. Our young specimen shows a distinct blotch between the pectoral and lateral line.

Bleeker remarks that this is distinguished from the true *hæmatopterus* by one more row of scales above the lateral line and by the rounded molars of the jaws, which, he says, are different in fishes of

¹ *Novara* Reise, Fische, 1860.

the same ages. Günther's *L. hæmatopterus* was a much larger fish and had a smaller eye, which was contained twice and a third in the snout and was not equal to the interorbital space. Our small specimen, labeled *Lethrinus richardsoni*, from Formosa, fits Bleeker's description well save for a lesser depth and corroborates his differentiating marks, i. e., the molars and the six rows of scales above the lateral line. There appear to be only two specimens of this recorded besides ours and that of Bloch and Schneider.

There is not much doubt that this is the original *Sparus chærorhynchus* of Bloch and Schneider, described from Japan. It is a species with broad body, clouded in color, with the anterior teeth conic, the posterior molar, the opercles scaly, the cheeks naked. D. X, 9; A. III, 11.

(χοῖρος, pig; ῥύγχος, snout.)

12. Genus EUTHYOPTEROMA Fowler.

Euthyopteroma FOWLER, Journ. Acad. Nat. Sci. Phila., 1904, p. 527 (*blochii*).

Type.—*Dentex blochii* Bleeker = *Sparus japonicus* Bloch.

Body rather elongate, covered with rather large ctenoid scales; about 50 in the lateral line; mouth rather small, the jaws equal; upper jaw with small canine teeth, none in the lower jaw; lateral teeth pointed, no molars; suborbitals unarmed; preopercle coarsely or finely serrulate; cheeks with three series of large scales; top of head scaly; preopercle naked, opercle without spine. Branchiostegals 6; air bladder notched. Dorsal rays X, 9; anal III, 7. Soft dorsal and anal scaleless, no sheath of scales at their base. Spines feeble, sometimes filamentous; caudal deeply forked, the upper lobe sometimes filamentous.

Species numerous in the East Indian region, mostly brightly colored, and showing analogies to *Aprion* and *Pristipomoides*. The genus is close to the European genus *Dentex*, differing in the more elongate body and the much larger scales on the cheek.

We here accept Fowler's division of the genus *Nemipterus* Swainson = *Dentex* Bleeker, not of Cuvier¹ = *Synagris* Günther.

In this group the following genera or subgenera may be recognized:

a¹. Lower jaw as well as upper with distinct canines; dorsal spines low, the membranes not notched, none of the spines or rays filamentous.

Synagris (= *Anemura*).

a². Lower jaw without distinct canines.

b¹. Dorsal spines all low, with the membranes not notched, the spines scarcely exerted. *Euthyopteroma*.

b². Dorsal spines unequal, the first two (or one) produced in long filaments, the membranes of the others not notched, the other spines scarcely exerted.

Nemipterus.

b³. Dorsal spines unequal, the middle ones highest, their membranes deeply notched, so that the tips of the spines are largely free *Odontoglyphis*.

¹ The genus *Dentex* of Cuvier is based distinctly on *Sparus dentex* of Linnæus, a Mediterranean species.

The following is the synonymy of the sections or genera included under *Nemipterus* and *Synagris*.

Nemipterus SWAINSON, Nat. Hist. Class. Anim., vol. 2, 1839, pp. 172, 223 (*filamentosus*=*nematophorus*) (dorsal spines caudal and ventral filamentous).

Synagris GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 373 (*furcosus*, etc.).

Dentex BLEEKER, Atlas Ichth., vol. 8, p. 83 (*taniopterus*); not of Cuvier.

Anemura FOWLER, Journ. Acad. Nat. Sci. Phila., 1904, p. 527 (*notatus*).

Odontoglyphis FOWLER, Journ. Acad. Nat. Sci. Phila., 1904, p. 527 (*tolu*).

Euthyopteroma FOWLER, Journ. Acad. Nat. Sci. Phila., 1904, p. 527 (*blochii*).

(εὐθύς, straight; πτερόμα, fin system.)

Key to species.

2¹. Upper lobe of caudal filamentous.

b¹. Preorbital width $4\frac{1}{3}$ in head, without distinct concavity near edge of maxillary. Side of body with a bright yellow streak which never fades in preservation, this obsolete in young; sides in life with other yellow stripes... *virgatum* 20.

b². Preorbital narrow, its width 7 in head, the suborbital region with a distinct concavity near edge of maxillary. Side of body without permanent yellow streak, but with stripes of brassy and golden in life..... *bathybium*, 21.

20. EUTHYOPTEROMA VIRGATUM (Houttuyn).

ITOYORI (twisted thread, probably from the yellow stripe on side).

Sparus virgatus HOUTTUYN, Holl. Maat. Wet. Haarlem, vol. 20, Deel 2, 1782, p. 3 (Nagasaki).

Nemipterus virgatus JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 346 (Keerun, Formosa).—JORDAN and RICHARDSON Fishes Formosa, Mem. Carnegie Mus., vol. 4, No. 4, 1909, p. 186 (Keerun).

Sparus sinensis LACÉPÈDE, Hist. Nat. Poiss., vol. 4, 1803, p. 46 (China, Japan).

Synagris sinensis GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 379 (China); STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denkschr. kais. Akad. Wiss. Wien, vol. 48, 1883, p. 16 (Tokyo, Tango, Kochi, Osima).—STEINDACHNER, Reise *Aurora*, Ann. Nat. Hofmus. Wien, vol. 11, Heft 2, 1896, p. 200 (Kobe or Nagasaki).

Nemipterus sinensis JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 77.

Dentex setigerus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 253 (Japan).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 73, pl. 37, fig. 1 (Nagasaki).

Habitat.—Coast of southern Japan and Formosa.

Description of four specimens from Tokyo and Nagasaki and one from Keerun, Formosa, the longest 330 mm. in total length without the caudal filament.

Head $3\frac{1}{2}$ in body, $4\frac{1}{2}$ in total length; depth $3\frac{1}{2}$ in body, $4\frac{1}{2}$ in total; eye 5 in head (in adult); snout $2\frac{2}{3}$ to $3\frac{1}{2}$; maxillary $2\frac{2}{3}$; D. X, 9; A. III, 8. Scales in lateral line 49, in transverse series from insertion of dorsal to insertion of anal $3\frac{1}{2}$ /10.

Body somewhat elongate, little compressed, its width one-half its depth; dorsal and ventral profiles similar. Head small, its dorsal outline somewhat arched, as it is in cross section. Eye small, $3\frac{1}{2}$ in head in a young specimen 170 mm. in total length, 5 in head in one

330 mm. in total length. Preorbital nearly quadrate, its posterior margin oblique. Maxillary largely sheathed, reaching barely to front of eye, mouth small. Preopercular margin slightly serrate, with a narrow dermal edge. Opercle with two flat points. Four or five small recurved canines in premaxillaries on either side of tip of upper jaw. Outer row on either side slightly enlarged, inner band narrow, villiform. In lower jaw an outer row anteriorly only. Inner row becomes single and enlarged somewhat laterally, although a villiform band anteriorly. Gill-rakers very short and stumplike, 6+8 in number.

Dorsal spines rather weak and flexible, of nearly equal length, $2\frac{2}{3}$ in head. Dorsal rays of equal length with spines, the last slightly longer. Anal spines also weak, third longest, 3 in head, first two-thirds length of third. Anal rays similar in length to those of dorsal.

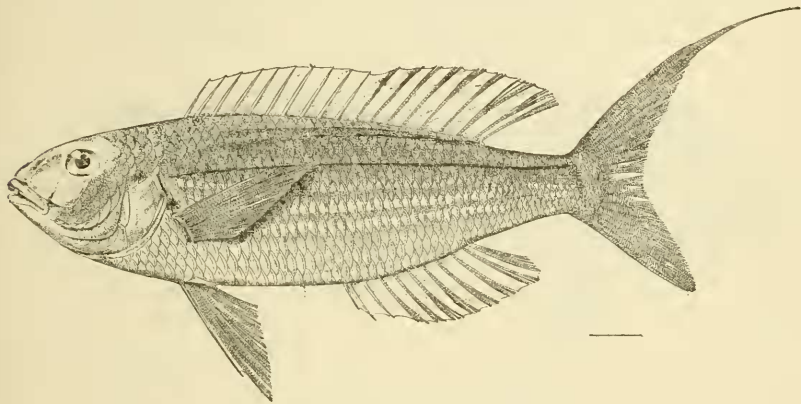


FIG. 5.—*EUTHYOPTEROMA VIRGATUM*.

Pectorals and ventrals subequal, nearly equal to length of head. Caudal deeply forked, the upper lobe prolonged into a filament nearly equal to length of head, and its length from base of caudal four times that of middle caudal rays.

Scales large, finely ctenoid; present across occiput, on cheeks, opercle, sub- and interopercle, not on limbs of preopercle or preorbitals. Scales on cheeks large, in three rows.

Color of alcoholic specimen silvery, darker above, more or less bright red in life. A narrow line of intense and permanent yellow extending from angle of opercle straight to upper rays of caudal, another parallel to it, one row of scales above lateral line, but broader and fainter anteriorly and ending at last rays of soft dorsal. Following rows of scales, or rather between them, below lateral line 6 or 7 silvery stripes as broad as pupil. In young fish the yellow lines have disappeared.

This beautiful fish is common in southern Japan. Our specimens are from Tokyo and Nagasaki.

(*virgatus*, streaked, from the yellow line.)

The following is the substance of Houttuyn's account of his *Sparus virgatus*:

The stripes of the scales plainer and much larger. In this respect, as also in shape, it is similar to the *Salpa* of authors, which has on its side eleven stripes of a golden hue. It is hence called in French "*Virgadelle*." The body is oval and flat, the head is blunt, the tail fork-shaped. In the dorsal I count 8 bony and 10 limber rays. P. 12; A. II, 8; V. 6; C. 22. My specimen is $5\frac{1}{2}$ inches long.

21. *EUTHYOPTEROMA BATHYBIUM* (Snyder).

Nemipterus bathybius SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 532. (Kagoshima).

The following is Professor Snyder's description of this species. We present a figure of his type-specimen from Kagoshima.

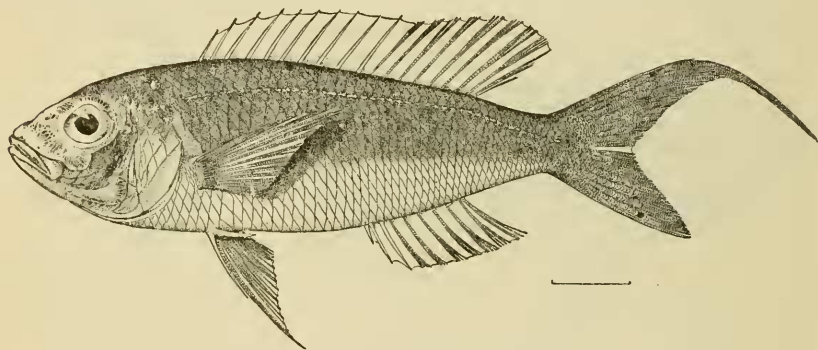


FIG. 6.—*EUTHYOPTEROMA BATHYBIUM*.

Three specimens of a *Euthyopteroma* which appears to be undescribed, were purchased in the Kagoshima market. The width of the suborbital at the narrowest point is not over half the diameter of eye, the maxillary extends to a point below anterior edge of pupil, there are 3 or 4 canines on either side of upper jaw, the dorsal fin is not filamentous, the last spine is highest, the upper lobe of the caudal is falcate, the ventrals extend to origin of anal, and there are 45 scales in the lateral line.

The species appears to be related to *Nemipterus japonicus* (Bloch), a species probably from Java, and not as yet known from Japan. When compared with specimens of the latter from Cavite, *E. bathybius* may be easily distinguished by the narrower preorbital which is deeply concave on its ventral edge.

Head 3.2 in length to base of caudal; depth 3.4; depth of caudal peduncle 3 in head; eye 3.6; snout 3.2; maxillary 2.6; width interorbital space 4; D. X, 9; A. III, 7; scales in lateral line 45; between lateral line and base of dorsal 3; between lateral line and origin of anal, obliquely downward and backward 9.

The interorbital space is convex; the snout rather pointed; sub-orbital area narrow, the width contained about 2.2 times in the longitudinal diameter of eye, the ventral edge with a deep and rather abrupt concavity near end of maxillary; the concavity together with the convex posterior edge giving the suborbital a distinctive form. Edge of preopercle smooth except for some very minute denticulations at its upper edge. Maxillary extending to anterior edge of pupil. Teeth of upper jaw villiform, an enlarged outer row with 3 or 4 canines on either side anteriorly; lower jaw with 2 rows of comparatively strong teeth anteriorly, a single row of enlarged teeth along the sides. Gill-rakers short and stubby, 4+9 on the first arch. Opercle with 3 rows of scales.

Dorsal spines high, rather slender and acute, the membrane not incised between their tips; last 3 spines longest, about 2.4 in head; anterior rays equal in height to the preceding spines, the posterior ones somewhat longer. Second anal spine intermediate in height between the first and third, 7.5 in head; last ray 2.3 in head. Lower lobe of caudal pointed, 1.3 in head; upper lobe falcate, a little over twice as long as the lower; edge of caudal deeply emarginate. Ventrals reaching origin of anal. Pectorals acutely pointed, equal in length to ventrals.

In life the body was bright silvery with a pinkish tinge and pearly reflections; a narrow lemon yellow stripe extends from upper edge of axil to middle of caudal peduncle, a faint brassy stripe along base of dorsal, a wide red stripe above lateral line, lateral line bordered by a light stripe with pearly reflections, below which is a brassy stripe narrowly bordered by dark pink; head pinkish, the snout purple; chin, breast, throat, belly, and lower surface of tail bright lemon yellow; dorsal translucent, the edge yellowish orange; vermiculations of lemon on membrane of fin; caudal bright pink, the filamentous rays yellow, becoming orange toward tip, upper edge of fin orange; anal and ventrals translucent; pectorals pink.

In spirits the body is rather reddish above, plain silvery below, all the bright tints having disappeared and no indication of the stripes remaining.

Type-specimen 280 mm. long including the caudal filament. Locality Kagoshima, Japan. Two smaller examples are like the type except that the ventrals are slightly shorter.

NOTE ON DENTEX THUNBERGI.

A species of Sparoid fish has been described from Japan under the name of *Labrus thunbergi*. The scanty description agrees in all respects with *Pristipomoides sparus*, on which species the description was probably based; but as no count of fin rays is given, the identification is perhaps too uncertain to justify the adoption of the name

Pristipomoides thunbergi in place of *P. sparus*. The following is the synonymy and the substance of the description:

Labrus thunbergi LACÉPÈDE, Hist. Nat. Poiss., vol. 4, 1803, p. 467 (Nagasaki).

Dentex thunbergii CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 237 (Japan).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 77 (after Cuvier and Valenciennes).

Synagris thunbergii BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7.

Body elongate, compressed, head equal to depth of body, which is contained nearly four times in the total length. The body is covered with finely ciliated scales. The teeth are very small, but there are four very large ones on each jaw, curved, well removed from one another, with smaller ones set in the intervals. Suborbital narrow and elongate. Caudal forked, pectoral short. Color brown, without spots. Edge of scales whitish.

13. Genus GYMNOCRANIUS Klunzinger.

Gymnocranius KLUNZINGER, Verh. z. b. Ges. Wien., vol. 20, 1870, p. 765 (*rivulatus*).

Paradentex BLEEKER, Atlas Ichth., vol. 8, 1876, p. 98 (on plate 30, fig. 3), (*microdon*).

Type.—*Gymnocranius rivulatus* Rüppell.

This genus is allied to *Dentex* and *Euthyopteroma*, differing in having the top of the head naked. Body deep, compressed. Mouth small; both jaws with small canines; more than three rows of scales on cheeks. Scales large, about 50; D. X, 10; A. III, 10. Species few, of the East Indian region.

(γυμνός, naked; κρανίον, skull.)

22. GYMNOCRANIUS GRISEUS (Temminck and Schlegel).

OMEDAI (big-eyed porgy).

Dentex griseus TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 72, pl. 36 (Nagasaki).—BLEEKER Nat. Tijds. Ned. Ind., vol. 7, 1854, p. 80 (Siboga), (in part); Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 88 (in part), (Nagasaki).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denkschr. Acad. Wiss. Wien, vol. 48, 1883, p. 16 (Tokyo).

Gymnocranius griseus BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7, No. 115 (Nagasaki); (not of Bleeker, Atlas Ichth., vol. 8, 1896, p. 96).

Dentex xanthopterus BLEEKER, Arch. Ned. Ind., vol. 2, 1845, p. 522 (name only).

Dentex lethrinoides BLEEKER, Verh. Bat. Gen. Kunst. Wct., vol. 23, 1849, p. 11; Nat. Tijds. Ned. Ind., vol. 1, 1850, p. 102 (Java).

Gymnocranius lethrinoides BLEEKER, Atlas Ichth., vol. 8, 1877, p. 96, pl. 334, fig. 3 (Java, Sumatra).

? *Lobotes microprion* BLEEKER, Nat. Tijds. Ned. Ind., vol. 2, 1851, p. 174 (Batavia) (young).

Habitat.—East Indies and southern Japan.

Description of five specimens 270 to 330 mm. in total length, from Wakanoura and Nagasaki, also some from Misaki, 130 to 170 mm. in length.

Head 3 in body length; depth, $2\frac{1}{5}$ to $2\frac{3}{5}$; eye, 3 to $3\frac{1}{3}$; snout, $2\frac{1}{3}$; maxillary, 3; suborbital width, $3\frac{1}{2}$; D. X., 10; A. III, 10; scales in longitudinal series 50 to 52, in transverse series from dorsal to anal insertion $5\frac{1}{2}/16$ or 17.

Body deep, compressed, its width about 3 in depth. Dorsal and ventral profiles similar, save for low position of tip of snout below axis of body. Head deeper than long, its dorsal outline arched and rising rapidly. Prefrontals prominent, interorbital space narrowest above pupils. Preorbitals deep as long, nearly quadrate, sheathing maxillary almost entirely. Jaws equal; mouth small; maxillary ending below anterior margin of eyes; lips papillate. Preopercular angle smooth, its posterior margin slightly oblique. Opercle short with two flat, obtuse points, the upper little prominent. In upper jaw several stout, curved and blunt canines of moderate size ante-

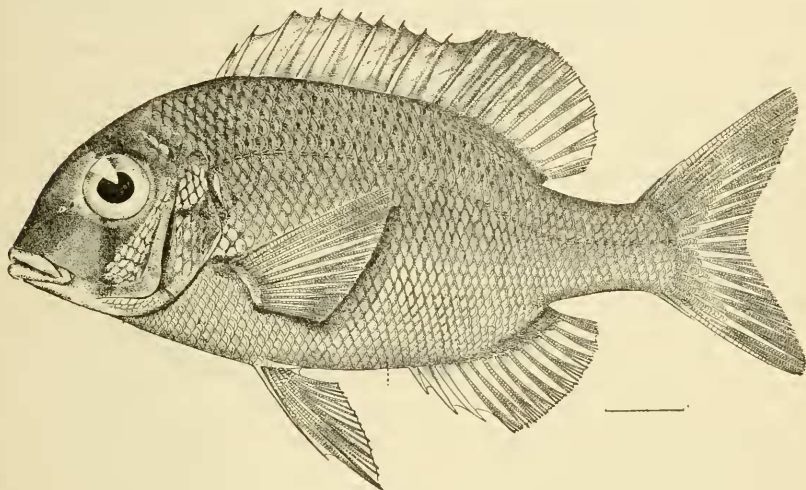


FIG. 7.—GYMNOCRANIUS GRISEUS.

riorly, in an outer row with a band of small, slender, sharp teeth behind them, latter merging into a single lateral row, posteriorly, of stout conical teeth, nearly molar in character and of slightly shorter length than canines. Lower jaw similarly toothed. Vomer, palatines and tongue edentulous.

Dorsal spines not flexible, fourth but very slightly longer than remainder, $2\frac{1}{2}$ to 3 in head. Dorsal rays higher, fifth and longest contained 2 in head. Anal spines strong, third longest, $2\frac{1}{2}$ to 3 in head; first two-fifths of length of third. First anal rays longest, slightly shorter than dorsal. Pectoral $1\frac{1}{5}$ in head, its first ray longest, its last two-fifths of its length. Ventrals extending to third anal spine, its first ray slightly filamentous, $1\frac{1}{5}$ in head. Caudal forked, its lobes (measuring from hypural plate) twice length of middle rays, which are $1\frac{1}{2}$ times longitudinal diameter of eye.

Scales absent on dorsal surface of head, preorbitals, lower jaw, maxillary, limbs of preopercle and anterior margin of opercle. A sheath of small scales present at bases of soft dorsal and anal. Membranes of caudal scaled at base and to tip of outer rays. Scales very finely ctenoid.

Young alcoholic specimens (up to 170 mm. in length) with about eight transverse bars of dark on body, first through angle of opercle and axil of pectoral; second from insertion of dorsal to lateral line, continued by a spot just behind ventrals; third from fifth and sixth dorsal spines across body; fourth similar, from last spines of dorsal to insertion of anal; fifth from second and third dorsal rays to first of anal; sixth from last of dorsal to axis of body, joining there with seventh from dorsal part of caudal peduncle, and ending at last anal rays; last indistinct across base of caudal. These bars more or less indistinct in different specimens. In our adults, of about 330 mm. length, they are barely to be seen and are much narrower, save for that through eye. Dorsal surface of head also dark; as is anterior half of spinous dorsal, anterior thirds of soft dorsal and anal, ventrals and caudal. A median lighter stripe sometimes present on caudal, parallel to fin margin. Pectorals clear, lining of mouth, of gill cavity, and peritoneum colorless.

This species is the *Gymnocranius lethrinoides* of Bleeker's Atlas¹ and not his *Gymnocranius griseus*. He had previously identified his Japanese specimens with *G. lethrinoides*, which view seems to be correct. Later he separated another species, which had been confused with *G. lethrinoides* and identified these as *G. griseus* Temminck and Schlegel. Unless both species are found in Japan, of which there is no record, his later decision seems erroneous. Our specimens correspond with the description given by him in "Nieuwe Nalezingen op de Ichthyologie van Japan" in its differences from *G. griseus* of the Atlas (namely, deeper preorbital, wider interorbital and smaller eye). We think therefore that his first identification should hold, and that *Gymnocranius lethrinoides* must be regarded as the same as the Japanese *G. griseus*.

This species is not rare in southern Japan. Our specimens are from Misaki, Wakanoura, and Nagasaki.

(*griseus*, gray.)

14. Genus TAIUS Jordan and Thompson.

Taius JORDAN and THOMPSON, new genus.

Type.—*Chrysophrys tumifrons* Temminck and Schlegel.

This genus contains, so far as known, a single species, with the skull structure, coloration and general aspect of *Pagrosomus*, but with a single row of conical teeth in the sides of the jaws besides a

¹ Vol. 8, 1877, p. 96.

band of granular teeth, and no true molar teeth at all. Mouth rather large. Both jaws with canines in front. Scales on cheeks in more than three rows; preopercle more or less scaly. Dorsal rays XII, 10, the spines low with exerted tips. Body compressed and elevated, with a deep preorbital. Parietal crests of cranium little developed. A single known species has the general aspect of *Pagrus* or rather of *Pagrosomus* with the dentition more like that of *Dentex*. The type of skull is precisely that of *Pagrosomus major*. In *Dentex dentex* of the Mediterranean the frontals are porous as in *Evynnis*. There is no hyperostosis of the supraoccipital. The parietal or epiotic crest is elevated as a thin edge, and it is placed farther from the supraoccipital than in *Pagrosomus* or *Taius*.

In spite of the absence of molars, *Taius* is much more nearly allied to *Pagrus* and *Pagrosomus* than to *Dentex*.

(*tai*, porgy, the common name of *Pagrosomus major* and of related species.)

23. TAIUS TUMIFRONS (Temminck and Schlegel).

KOTAI (baby porgy); **MAKODAI** (true baby porgy); **BENIKODAI** (red baby porgy); **KINKODAI** (red baby porgy); **KITAI** (yellow tai or porgy).

Chrysophrys tumifrons TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 70, pl. 34 (Nagasaki).

Pagrus tumifrons GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 470 (after Temminck and Schlegel).—NYSTRÖM, Jap. Fisksaml. K. Svenska Vet. Akad., vol. 13, Afd. 4, 1887, No. 4 (Nagasaki).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 79.—KISHINOUE, Journ. Fish. Bur. Tokyo, vol. 10, 1901, No. 3, p. 38, pls. 3; pl. 5, fig. 5-8; pl. 7, fig. 2 (Japan: Hondo, Shikoku, Kiushu, and Formosa).

Sparus tumifrons BLEEKER Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7.

Dentex hypselosomus BLEEKER, Japan, Nat. Tijds. Ned. Ind., vol. 6, 1854, p. 402 (Nagasaki); Verh. Bat. Gen., vol. 26, 1857, pl. 4, fig. 2 (Japan) p. 89.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 371 (after Bleeker).—STEINDACHNER, Reise Aurora, Ann. Nat. Hofmus. Wien., vol. 11, 1896, Heft 2, p. 199 (Japan).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 77.—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 345, fig. 17 (Formosa).—JORDAN and RICHARDSON, Fishes Formosa, Mem. Carnegie Mus., vol. 4, 1909, No. 4, p. 185, fig. 15.

Synagris hypselosoma BLEEKER, Atlas Ichth., vol. 7, 1876, pl. 36, fig. 2; Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 7.

Habitat.—Southern Japan and China.

Description of three specimens from Takao, Formosa, 245 to 280 mm. in body length:

Head $2\frac{2}{3}$ in body length to last vertebra; depth 2; eye $3\frac{3}{8}$; interorbital breadth $3\frac{3}{8}$; preorbital depth $3\frac{3}{8}$; snout $2\frac{1}{4}$; D. XII, 10; A. III, 8; scales in lateral line 49; in transverse series from insertion of dorsal to that of anal 6/14 (6/12-17, Kishinouye); gill rakers 8+11; pyloric cæca 4.

Profile of head rising steeply, slightly concave before eyes, convex over them; rising in a steep, even curve to nape. Interorbital space arched rather strongly from eye to eye, more so in older specimens; preorbital depth equal to, or less than eye, contained $1\frac{2}{3}$ in its own length; maxillary $2\frac{2}{3}$ in head, ending under anterior border of eye. Breadth of preopercle at angle equal to that of cheek, its margin not very flexible. Posterior nostril as far from eye as from anterior nostril. Posterior margin of suborbitals, between smaller and larger, strongly notched in all our specimens (not in Kishinouye's figure). Vomer toothless. Jaws without distinct molars, a single row of stoutly conical, sharp teeth laterally in each jaw, with several inner rows of very small granular teeth. Four large, stout, somewhat

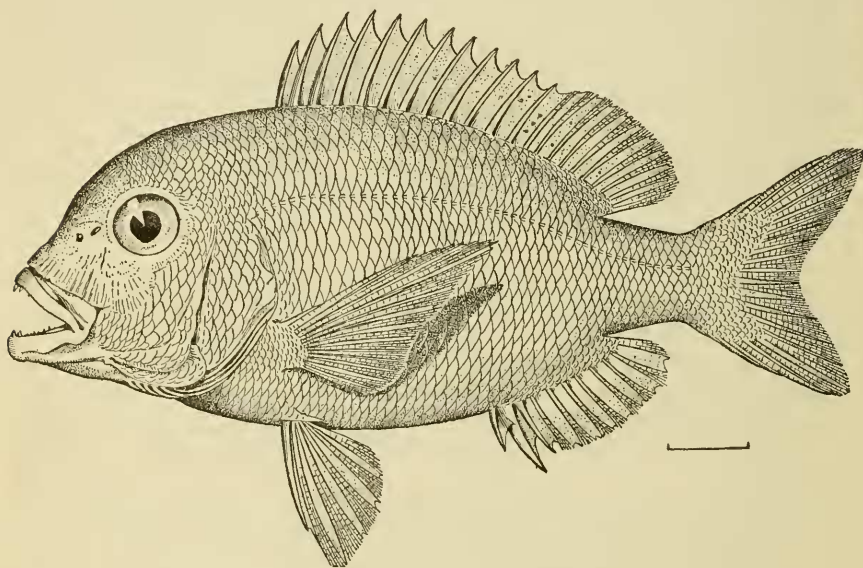


FIG. 8.—*TAIUS TUMIFRONS*.

recurved canines in front of each jaw. Gill rakers half length of gill filaments.

Dorsal spines stout, first $5\frac{1}{2}$ in head, or two-thirds of eye; second slightly longer than eye, 3 in head; third $2\frac{2}{3}$ in head. Dorsal rays equal to last spine, $3\frac{1}{2}$ in head. Anal spines stouter than dorsal spines, second somewhat longer than third, 3 in head; rays about same length. Pectorals 3 in body length, or $1\frac{1}{10}$ in head; lower rays slightly produced; ventrals reaching nearly to anus, $1\frac{1}{2}$ in head.

Scales present on preopercular limbs, in 3 or 4 rows, on cheek in 5 or 6, on interopercle in 3 rows; on bases of dorsal and anal fins as a low sheath. Scales finely ctenoid.

Color (Kishinouye) reddish with golden luster, two or three markings of yellowish found dorsally; lower portion of body silvery white; no blue spots present; membrane on posterior margin of opercle

pale blue. Iris reddish. In life the snout is golden yellow, and there is a diffuse yellow blotch under the dorsal.

Skeletal characters: Frontals heavy, thick, slightly porous, approaching those of *Pagrosomus major*. Supraoccipital crest inserted over middle of eyes, moderately high. Parietal crest typical of Asiatic allies of *Pagrus*, here called *Pagrosomus*, low, hardly produced as a thin layer of bone, as far from the supraoccipital as from the outer crest. Hyperostosis or thickening not evident, although the supraoccipital crest is slightly thickened above. First spurious interneural small, slender.

This species not very common in Japan. No specimens are in our collection except from Formosa. In spite of the absence of molars, this species is in essentials like the species of *Pagrosomus*. Since the above was written we have found this species in great abundance in the markets of Osaka, taken by the trawlers off Tsushima. It forms the principal part of the catch of these vessels between Nagasaki and Fusan.

(*tumifrons*, having the forehead swollen.)

13. Genus EVYNNIS Jordan and Thompson.

Evyannis JORDAN and THOMPSON, new genus.

Type.—*Sparus cardinalis* Lacépède.

This genus differs from *Pagrosomus* in the presence of a group of conical bluntish teeth on the head of the vomer, a character unique in this family. In one other genus, *Neolethrinus*, there are molar teeth on the vomer and elsewhere on the roof of the mouth. Supraoccipital crest in old specimens very high, advanced forward to near the front of the eye, largely covering the spongy frontal bones which are full of pores. No scales on preopercular limb. In the single known species the third and fourth dorsal spines are elevated, as in the species of *Argyrops* (spinifer, etc.), but to a less degree.

(*εῖ*, well; ὄνυξ, vomer.)

24. EVYNNIS CARDINALIS (Lacépède).

CHIDAI (blood red tai or porgy); **HIRKODAI** (small fin porgy); **HORENAGA** (long fin); **HANADAI** (flower porgy); **CHIKODAI** (child porgy); **KUNDAI**.

Sparus cardinalis LACÉPÈDE, Hist. Nat. Poiss., vol. 4, 1803, p. 141.—STEINDACHNER, Reise Aurora, Ann. Nat. Hofmus. Wien, vol. 11, Heft 2, 1896, p. 200 (Japan).

Chrysophrys cardinalis CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 130 (Japan).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 69, pl. 33 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846 (Canton).—BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879.

Pagrus cardinalis GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 470 (China).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Deutschr. kais. Akad. Wiss. Wien., 1883, p. 19 (Tokyo, Oshima, Nagasaki).—NYSTRÖM, K. Svenska. Vet. Akad., vol. 13, Afd. 4, 1887, No. 4, p. 14 (Nagasaki).—JORDAN

and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 79 (Yokohama).—KISHINOUE, Journ. Fish. Bur. Tokyo, vol. 10, No. 3, 1901, p. 36, pls. 2, 5, and 7, fig. 3 (Japan, Kiusiu, southern coast of Shikoku, northwestern and northeastern coasts of Hondo, China, Korea).

Habitat.—Coasts of Japan and China.

Description of five specimens from Tokyo and one from Matsushima, 160 to 247 mm. in length:

Head $3\frac{1}{6}$ in body length, depth $2\frac{1}{3}$; eye 4 in head; preorbital depth 4; interorbital width 3 to $3\frac{1}{3}$; maxillary $2\frac{1}{2}$; snout $2\frac{2}{7}$; D. XII, 10; A. III, 9; scales in longitudinal series 58 to 64; in transverse series between insertions of dorsal and anal 7/15 or 16; gill-rakers 7 or 8 + 11 or 12.

Profile of head and occiput rising steeply in a strong curve; interorbital space much arched, more so than in *Pagrosomus major*; occiput usually prominent, depth of preorbital contained $1\frac{1}{2}$ in its length, its depth less than that of *P. major*; maxillary ending under anterior margin of eye. Width of preopercle greater than that of scaled portion of cheek, or at least equal. Posterior nostril oval, its distance from the eye contained 4 times in the latter's length. Vomer with several conical teeth. Teeth in upper jaw in two rows of molars posteriorly, the inner larger but replaced anteriorly by a band of granular teeth, outer teeth larger and more conical anteriorly; a set of two canines on a side in front. Teeth in lower jaw similar save that the inner row is larger posteriorly, and three canines are present on a side.

Dorsal spines flexible, the third and fourth somewhat filamentous. Second spine 5 in head, three-quarters of eye diameter in length; third spine over half length of head; fourth slightly less; fifth $2\frac{1}{6}$ to $2\frac{1}{2}$ in head. Anal spines equal, $3\frac{1}{6}$ in head. Pectoral longer than head by about half eye, the lowermost rays half as long, being slightly produced. Ventrals $1\frac{1}{2}$ in head. Caudal forked.

Scales as in *Pagrosomus major*, 7 rows on cheek, 4 rows on interopercle.

Color in life (after Kishinouye) in general resembling that of *Pagrosomus major*, but much brighter. Posterior margin of preoperculum dark red. Iris partly brown, partly silver white.

The males and females of this species, according to Kishinouye, differ in the profile of the head: "In the male the occipital crest is rectangular, so that the forehead is very prominent. In the female, on the other hand, the occipital crest is triangular and the forehead is beautifully arched." He writes that these fish grow to a length of half a meter.

From *Pagrosomus major* this species may be distinguished by the teeth on the vomer, the cavernous frontals, the anterior hyperostosis of the supraoccipital crest, the lack of the same in the first spurious interneural, and by the filamentous second and third dorsal spines.

Kishinouye records the collection by Mr. Nakamura of a skull lacking these vomerine teeth and supposes it a hybrid with *P. major*. Whether the difference in frontals is due to hyperosteal thickening is questionable.

This species is rather common in Japan, less abundant and smaller in size than the red Tai. We saw this species at Matsushima, Tokyo, Misaki, and probably in other places.

(*cardinalis*, cardinal red.)

16. Genus PAGROSOMUS Gill.

Pagrosomus GILL, Mem. Nat. Acad. Sci., vol. 6, 1893, p. 97 (*auratus*=*unicolor*).

Sparosomus ¹ GILL, Mem. Nat. Acad. Sci., vol. 6, 1893, pp. 116, 123.

(*auratus*) (*lapsus* for *Pagrosomus*).

Type.—*Labrus auratus* Bloch and Schneider.

Body oblong, rather deep, compressed, covered with large scales. Head large; preopercle entire; opercle not armed. Mouth rather small, terminal, low, the anterior teeth in the jaws cardiform, the outer series of teeth generally enlarged, caninelike, not compressed, the teeth behind the canines slender and acute. Both jaws with 2 or 3 series of rounded molar teeth, which are sometimes irregularly mixed with slender teeth. No teeth on vomer or palatines. Posterior nostril oblong, not slitlike, much larger than anterior. Preopercle with a few scales or none. Dorsal spines about 12 in number, depressible in a groove; anal spines moderate, the second not greatly developed; second interhæmal spine not pen shaped; no antrorse dorsal spine; supraoccipital crest high, the inner lateral or parietal crests low, little developed. Caudal fin forked; air bladder simple; gill-rakers short; branchiostegals 6; intestinal canal short; pyloric cæca few. Carnivorous fishes, mostly of the coasts of Asia and Australia, closely related to the Atlantic genus *Pagrus*,² but differing, as understood by us, in the deep body, the depth about two-fifths of the length, and in the little development of the inner lateral crest of the cranium. This is obsolescent in *Pagrosomus auratus* and *Pagrosomus major*. In the related genus, *Argyrops* ³ (*spinifera*) the body is still deeper and the back more elevated; the parietal crests are rather higher and further removed anteriorly from the supraoccipital crest, although rather lower than in the genera *Pagrus* and *Dentex*. In *Argyrops*, the dorsal spines are much elevated, and filamentous, even more so than in *Evynnis cardinalis*. On the whole, *Argyrops spinifera* seems to be generically

¹ Not *Sparisoma* Swainson, Class. Anim., vol. 2, 1839, p. 227, a genus of Scaroid fishes; not *Sparosoma* Sauvage, Bull. Soc. Geol. (3), vol. 11, 1883, p. 487, a genus of fossil fishes.

² Cuvier, Règne Animal, ed. 1, 1817, p. 272, Type, *Sparus pagrus* Linnæus.

³ *Argyrops* Swainson, Nat. Hist. Class. Fishes., vol. 11, 1839, p. 221 (*spinifer*). *Argyrops spinifera* (Forskål) occurs in Formosa, but is not known from Japan.

distinct from *Pagrosomus*, and we adopt the latter name for the Japanese species.

(πάγρος: porgy; σῶμα: body.)

Key to species.

*a*¹. Dorsal rays XII, 10; scales 53.

*b*¹. Width of preorbital $4\frac{3}{4}$ in head; 8 rows of scales above the lateral line; hyperostosis, or thickening, of supraoccipital crest at its base *major*, 25.

*b*². Width of preorbital $3\frac{1}{2}$ in head; 9 or 10 rows of scales above lateral line; hyperostosis on upper edge of supraoccipital crest *auratus*, 26.

25. *PAGROSOMUS MAJOR* (Temminck and Schlegel).

TAI, AKADAI (red porgy); **ODAI** (big porgy); **MATADAI** (fork porgy).

Chrysophrys major TEMMINCK and SCHLEGEL, Fauna Japonica, 1842, p. 71, pl. 35 (Nagasaki).

Pagrus major GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 470 (China and Japan).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denkschr. kais. Akad. Wiss. Wien, 1883, p. 19 (Tokyo).—NYSTRÖM, Jap. Fisksaml. K. Svenska. Vet. Akad., vol. 13, Afd. 4, 1887, No. 4 (Nagasaki).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901.—KISHINOUE, Fish. Bur. Tokyo, vol. 10, No. 3, 1901, p. 32, pls. 4, 6, 7, fig. 1 (Japan, from southern part of Hokkaido to Formosa, Korea, China). (Cranium, interneurals, and jaws figured, with an excellent colored plate.)

Sparus major BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879.

Pagrus unicolor RICHARDSON, Ichth. China and Japan, 1846, p. 242 (Canton).—KNER, Reise Novara Fische, 1860, p. 85 (Hongkong and Auckland).—REGAN, Ann. and Mag. Nat. Hist., ser. 7, vol. 15, 1905, p. 20 (Inland Sea of Japan).—STEINDACHNER, Sitzungber. Akad. Wiss. Wien, vol. 61, 1870, p. 625 (China).

Description of numerous specimens up to 300 mm. in length from Wakanoura, Aomori, Tokyo, and Nagasaki, one from Tokyo, 163 mm. in body length, taken as typical:

Head $3\frac{1}{8}$ in body length; depth $2\frac{1}{2}$; eye 4 in head, preorbital width $4\frac{3}{4}$; interorbital space 3 to $3\frac{1}{2}$; maxillary $2\frac{1}{2}$; snout $2\frac{1}{4}$ to $2\frac{1}{2}$; D. XII, 10; A. III, 8; scales in longitudinal series 56 to 63; in transverse series between insertions of dorsal and anal 8/16 to 18; gillrakers 7 to 9+10.

Profile of head and occiput rising less steeply than in *Evyinnis cardinalis*, interorbital space not as highly arched, occiput not usually as gibbous; depth of preorbital contained $1\frac{2}{3}$ in its length; maxillary ending under anterior margin of pupil. Width of preopercle considerably less than width of scaled cheek. Posterior nostril slit like, nearer eye and slightly longer than in *Evyinnis cardinalis* or *Taius tumifrons*, its distance from the eye about 6 in orbital length. Vomer toothless. Teeth in upper jaw in two rows posteriorly, the inner molar, the outer less so, the latter becoming more conical anteriorly, the former being replaced by a band of minute granular teeth in three series. Two stout canines present on either side anteriorly. In lower jaw dentition similar, but with three anterior canines on a

side. Supraoccipital crest high, not extending forward before eye; frontal bone solid with few pores, epiotic or parietal crests little developed. Dorsal spines not filamentous; second equal, or slightly less than length of eyes, about $3\frac{5}{8}$ in head, longer than in *Evyinnis cardinalis*; third and fourth about 2 in head; fifth $2\frac{1}{4}$. Second and third anal spines usually equal, second sometimes stronger, 3 to $3\frac{1}{2}$ in head. Pectoral extending slightly beyond anal insertion, longer than head by half length of eye, its lowest rays slightly elongate; ventral $1\frac{1}{2}$ in head. Caudal deeply forked.

Scales not present on bases of soft dorsal and anal. Head scaled to above eyes. Preopercular limbs with an occasional scale; cheeks with 7 rows.

Color (Kishinouye): Back reddish, generally with greenish luster and many blue spots; belly silvery. Iris of eyes brownish with golden luster, upper portion of orbit blue. Upper posterior margin of operculum and base of pectoral fin dark brown; lower part of caudal fin whitish, tinged with blue, while the posterior margin of the fin is generally fringed with black. In old specimens the coloration is dusky, and blue spots are not generally found. Our alcoholic specimens are nearly uniform in color, with a few traces of blue spots. Peritoneum and gill cavities silvery.

This species has frontals which differ markedly from those of *Evyinnis cardinalis*, being heavy, thick, and little cavernous. The supraoccipital crest is thickened greatly in its posterior, lower part, and the first spinous interneural is enlarged and thick in its upper portion. The thickening of the supraoccipital and the interneural is evidently due to hyperostosis (with age), but this is not so evident in the case of the frontals, as a young specimen 10 cm. in length had frontals as little porous as the adult, although not nearly as heavy. The whole cranium is longer for its depth than that of *Evyinnis cardinalis*.¹ The observations recorded above as to the relative widths of the scaled portion of the cheek and of the preopercle do not seem to apply to Kishinouye's figure, although it was true of all our specimens.

We can find no distinguishing characteristics in *Pagrus arthurius* Jordan and Starks from Port Arthur on a careful comparison of the type with specimens of *Pagrosomus major* from Japan. The depth of the preorbital stated to distinguish it is exactly the same, as is the size of the eye, measuring in hundredths of body length. The shortness of the third spine of the dorsal is due to injury. *Pagrus arthurius* is therefore a synonym of *Pagrosomus major*, as is also *Pagrus ruber* Döderlein. This nominal species is thus described.

Head 3 or less in body; depth $2\frac{2}{3}$; eye $2\frac{2}{3}$ in head; interorbital space 4; snout 3; preorbital height $1\frac{2}{3}$ to $1\frac{1}{2}$ in eye; D. XII, 10;

¹ See Kishinouye, Journ. Fish. Bur. Tokyo, vol. 10, No. 3, 1901, for figures of skull, etc.

A. III, 8; scales in lateral line 53-54; in transverse series 8/1/13 (or 14?).

Interorbital space flat from side to side, posterior to it a prominent ridge rises along the midline of the occiput to the insertion of the dorsal, formed on the head by the supraoccipital crest. Profile of the head ascending less rapidly than in *Pagrosomus major* and *Erynnis cardinalis*. Maxillary ending before the middle of the eye. Molar teeth small, in two rows in both jaws, canines in the premaxillaries as in *Pagrosomus major* and *Erynnis cardinalis*.

Third, or third and fourth, dorsal spines slightly exceed half the head length, in one case contained $1\frac{4}{5}$, in another $1\frac{9}{10}$ in the head. Second dorsal spine equals or is somewhat less in length than the eyes, and is contained $1\frac{3}{5}$ to $1\frac{1}{2}$ times in the height of the third spine. Second anal spine is somewhat longer than the third.

Color of ventrals gray in distal half; dorsal with gray-brown spots here and there, especially on the soft portion.

According to Döderlein this species differs from *Pagrosomus major* in the more elongated body, the larger eyes, and the lesser number of scales along the lateral line. Kishinouye notes that he considers the presence of this species in Japanese waters "ambiguous," as he is unable to find any specimens to correspond to this description. Döderlein had two specimens to which he applied this name, the one described being 133 mm. long. The differences given do not warrant a division. One of our specimens of *Pagrosomus major* has 55 scales in the lateral line, yet differs in no other way from the typical specimens.

Pagrosomus major is the common red "Tai" or "Akadai" of the markets of Japan. It is everywhere very abundant to the southward of Tokyo. Its flesh is excellent, firm, and white. It is in a way the national emblem of Japan. It is the fish borne in all pictures of the fishery god *Ebisu*, and luck comes to the fisherman with the red Tai or porgy.

We saw this species at Aomori, Misaki, Tokyo, Wakanoura, and Nagasaki.

(*major*, larger.)

26. PAGROSOMUS AURATUS (Forster).

The Snapper of the Australian Seas.

Labrus auratus (*Sciæna aurata* Forster) BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 266 (Queen Charlottes Sound).

Sciæna aurata FORSTER, Descr. Anim., Ed. Lichtenstein, 1844, p. 307, same specimen.

Pagrosomus auratus GILL, Mem. Nat. Acad. Sci., vol. 6, 1893, p. 97, and of Stead and other Australian ichthyologists.

Sparosomus auratus GILL, Mem. Nat. Acad. Sci., vol. 6, 1893, pp. 116, 123.

Chrysophrys unicolor QUOY and GAIMARD, Voy. *l'Uranie*, 1824, p. 229 ("Baie des Chiens Marins," Dick Hartog Island, Australia).

Pagrus unicolor CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 162, same specimens.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 468 (New Zealand, Australia; Chinese Seas?).

Sparosomus unicolor and *Pagrosomus auratus* of many AUTHORS.

Pagrus guttulatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1830, p. 160 (King Georges Sound).—LESSON, Voy. *Coquille*, Zool., vol. 2, 1830, p. 188 (New Zealand).

Pagrus micropterus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1830, p. 163 (New Zealand).

Pagrus latus RICHARDSON, Rep. Brit. Ass. Adv. Sci., 1842, p. 209.

Described from two specimens, 220 and 460 mm. long, from Caloundra Banks, Australia, and from Wanganui, New Zealand, respectively.

Head 3 in body length; depth $2\frac{1}{4}$; eye $3\frac{3}{8}$ ($5\frac{1}{3}$ in large specimen) in head; depth of preorbital $3\frac{5}{8}$; snout $2\frac{1}{8}$; maxillary $2\frac{1}{3}$; D. XII, 10; A. III, 8; scales in lateral line 57, in transverse series between insertions of dorsal and anal 9 or 10/17; gill-rakers 8 + 11.

Body deepest before insertion of dorsal, tapering posteriorly, head profile very steep, and but slightly arched, save at occiput. Length of maxillary equal to that of preorbital, which is $1\frac{1}{2}$ times its depth. Distance between nostrils equal to length of posterior one. Width of preopercle less than that of scaled cheek, its margin ribbed, but not serrate. Teeth as in *Pagrosomus major*, in two series in both jaws, the inner molar like, the outer more conical, inner row becoming replaced by minute granular teeth, outer becoming more conical anteriorly. Two pairs of canines above and three below in front. Gill-rakers short and stout.

Fourth dorsal spine highest, $2\frac{1}{3}$ in head, not produced; second and third anal spines subequal, $3\frac{1}{2}$ in head; pectoral equal to head plus half eye, its lower rays somewhat produced; ventrals $1\frac{3}{8}$ in head, reaching anus; caudal deeply forked, its lobes equal to head.

Scales not present on vertical fins save as low sheath, nor on preorbitals, snout before eyes, lips, or jaws. An occasional scale on the preopercle. Cheeks with 7 or 8 rows.

Color silvery, darker above, fins uniform.

Cranial crests as in *Pagrosomus major*, the inner or parietal little developed; supraoccipital crest inserted above anterior margin of eye, its upper edge thickened by hyperostosis as in *Evygnnis cardinalis*. First spurious interneural also thickened.

Pagrosomus auratus, the most abundant and valuable of Australian food fishes, has been recorded several times from Chinese Seas and by Regan from the Inland Sea of Japan, under the name of *Pagrus unicolor*. None of the authors give any details regarding their specimens, however, and it is not impossible that all of them are really *Pagrosomus major*, to which *P. auratus* is closely related. The latter differs mainly in these regards: A larger eye in specimens of

similar size, a deeper preorbital, longer snout (?), and in the supra-occipital crest, which is thickened by hyperostosis in the same region as in *Evynnis cardinalis*. The following table gives a comparison of *Pagrosomus major*, *P. auratus*, and the type of *Pagrus arthurius*:

	"Pagrosomus major," Tokyo.	"Pagrus arthurius," Port Arthur.	"Pagrosomus auratus," Australia.	"Pagrosomus auratus," New Zealand.
Body length.....mm.	195	252	220	460
Head ¹	31.5	32.0	34.0	35.0
Depth.....	42.5	44.0	44.0	43.0
Eye.....	8.5	8.5	9.5	6.5
Preorbital depth.....	7.5	7.5	9.0	9.0
Snout.....	14.5	14.5	16.0	17.0
Maxillary.....	12.0	13.0	13.0	15.0
Height of fourth dorsal spine.....	14.5	14.0	15.0	14.0
Height of second anal spine.....	10.0	10.5	11.0	10.0
Dorsal rays.....	XII, 10	XII, 10	XII, 10	XII, 10
Anal rays.....	III, 8	III, 8	III, 8	III, 8
Scales in lateral line.....	57	55	57	56
Scales in transverse series.....	8/17	8/17	9/17	10/17
Gill-rakers.....	7+9	8+9	8+10	8+11

¹ Measurements given in hundredths of body length.

(*auratus*, gilded.)

Since this paper was completed Mr. Regan has written to me concerning the Japanese specimen recorded by him as *Pagrus unicolor*:

I have compared my Japanese *unicolor* with Australian specimens, and with Japanese *major*. I should say they are the same species as the latter, but I should certainly not like to say that they are specifically different from the Australian specimens. I shall be interested to see what you consider the distinctive characters of the two forms.

The species *Pagrosomus auratus* should therefore be omitted from the list of Japanese fishes. At the same time it must be confessed that *Pagrosomus major* is very close to it and that it may ultimately prove indistinguishable. The only differences we detect are those slight ones indicated in the above description.

17. Genus SPARUS Linnæus.

Sparus ARTEDI, Genera Piscium, 1738, p. 35.

Sparus LINNÆUS, Syst. Nat., ed. 10, 1758, p. 277 (*aurata*, *pagrus*, etc.).

Chrysophrys CUVIER, Règne Anim., ed. 1, 1817, p. 272 (*aurata*).

Aurata RISSO, Europe Méridionale, 1826, p. 356 (*semilunata*=*aurata*).

Sparus FLEMING, British Animals, 1828, p. 211 (restricted to the gilthead, *Sparus aurata*).

?*Chrysoblephus* SWAINSON, Nat. Hist. Class. Anim., vol. 2, 1839, p. 221 (*gibbiceps*); (median molars very large; preopercular limb scaly).

Pagrichthys BLEEKER, 1860 (dried specimen, with one anal spine removed).

Type.—*Sparus aurata* Linnæus.

This genus agrees in general with *Pagrus*, but the species are olive and silvery in color, never red, and the teeth are in broader bands, the upper molars in three or more series. The scales are smaller than in *Pagrus*, *Pagrosomus*, and *Argyrops* and the body is still deeper.

The parietal (epiotic) crests of the cranium are well developed, much as in *Pagrus pagrus*. Species rather numerous on the coasts of the Old World from England to Japan. The group called *Chrysoblephus*, from South Africa, with the median molars enlarged, is probably generically distinct. The genus *Calamus*, from tropical America, resembles *Sparus* externally, but differs remarkably in the enlarged and hollow interhæmal spine.

(*sparus*, σπάρος, the ancient name, from σπαίρω, to gasp.)

Key to species.

- a¹. Snout very blunt, the profile approaching the vertical; anal rays III, 11; dorsal rays XI or XIII, 13; scales about 60; rows of olivaceous stripes along the series of scales *aries*, 27.
- a². Snout more or less acute, the profile oblique; anal rays III, 8; scales 45 to 54.
- b¹. Body rather deep, the depth $2\frac{1}{2}$ in body length; dorsal rays XI, 12; scales 45; second anal spine $1\frac{1}{2}$ in head; olivaceous spots along the series of scales; a dark spot at origin of lateral line, lower fins yellow. *latus*, 28.
- b². Body moderately elongate, the depth $2\frac{3}{4}$ in length; dorsal rays XI, 12; scales 54; second anal spine $2\frac{1}{4}$ in head; no distinct streaks of spots along rows of scales; color dark; anal fin partly black. *swinhonis*, 29.

27. SPARUS ARIES (Temminck and Schlegel).

HYODAI (front porgy); HEDAI (grunt porgy).

?*Sparus sarba* FORSKÅL, Descr. Anim., 1775, p. 31 (Red Sea).

?*Chrysophrys sarba* CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 102 (Isle de France).—RÜPPELL, N. W. Fische, 1835, p. 110, pl. 28, fig. 1 (Red Sea).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 488 (Red Sea).—KNER, Reise Novara, Fisch., 1860, p. 88.—KLUNZINGER, Syn. Fische Roth. Meer., Verh. z. b. Ges. Wien, vol. 20, 1870, p. 759 (Red Sea).—DAY, Fishes India, 1875, p. 142, pl. 34, fig. 6 (Madras).—SAUVAGE, Poiss. Madag., 1891, p. 195, pl. 25a, fig. 3 (Lagunes of eastern coast of Madagascar).

Sparus sarba JORDAN and SEALE, Fishes Hongkong, Proc. Davenport Acad. Sci., vol. 10, 1905, p. 10 (not synonymy).

?*Sparus bufonites* LACÉPÈDE, Hist. Nat. Poiss., 1803, pp. 141, 143, pl. 26, fig. 3.

?*Sparus psittacus* LACÉPÈDE, Hist. Nat. Poiss., 1803, pp. 141, 143.

?*Chrysophrys chrysargyra* CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 107 (Vizagapatam).

Chrysophrys aries TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 67, pl. 31 (Nagasaki).—BLEEKER, Verh. Bat. Gen., vol. 26, 1857, p. 87 (Nagasaki).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 489 (China).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denkschr. kais. Akad. Wiss. Wien, vol. 48, 1883, p. 18 (Tokyo, Tango).

Sparus aries JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 79 (Yokohama).

Sparus latus JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 350 (Giran, Formosa).—JORDAN and RICHARDSON, Fishes Formosa, Mem. Carnegie Mus., vol. 4, No. 4, 1909. (Not of Houttuyn, not *Pagrus latus* Richardson.)

Habitat.—Coasts of southern Japan and China. Possibly identical with *Sparus sarba* Forskål of the Red Sea and East Indian region.

Description of nine specimens from Wakanoura, one from Nagasaki, three from Tokyo, two from Hongkong, and one from Moreton Bay, Queensland, Australia. Body lengths ranging up to 250 mm.

Head $3\frac{1}{2}$ in body length; depth $2\frac{1}{8}$; eye $4-4\frac{1}{2}$ in head; depth of preorbital $3\frac{1}{2}$ to $4\frac{1}{2}$; D. XI or XII, 13; A. III, 11; scales in longitudinal series 56 to 64, in transverse between insertions of dorsal and anal 7 or 8/13 or 14; gill-rakers 6+8.

Dorsal profile arched more strongly from snout to dorsal than posteriorly; mouth low, close to straight ventral profile; lower jaw included; snout short, rounded, slightly overhanging premaxillaries, its profile approaching the vertical at tip. Eyes well below upper surface of head, interorbital region arched strongly from side to side, 3 in head; frontals prominent. Snout $2\frac{1}{4}$ in head, maxillary $2\frac{1}{2}$, ending under anterior half of pupil. Preorbitals broader than eye in adults. Preopercular margin entire, flexible. Jaws powerful, heavy. Teeth in upper jaw in four rows of molars, outer rounded,

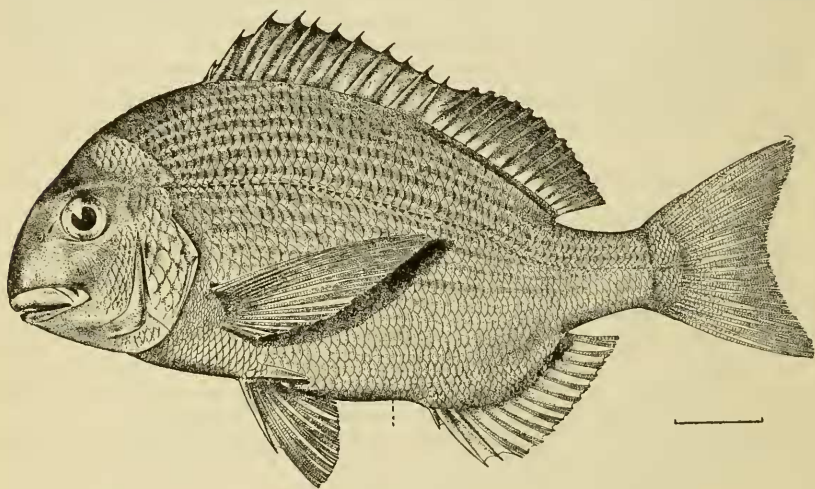


FIG. 9.—SPARUS ARIES.

small; inner largest; third consisting posteriorly of two very large molars; fourth and innermost ending at middle of jaw. Three rows of molars in lower jaw, outermost smallest, rounded, second enlarging posteriorly, to form three very large molars, the last largest; third row ending before middle of jaw. Three incisor teeth on either side of both jaws in front, set somewhat rodent-like.

Third and fourth dorsal spines longest, $2\frac{1}{3}$ to $2\frac{1}{2}$ in head; last $2\frac{2}{3}$ in head, slightly longer than succeeding ray, which is longer than the last rays. Anal spines similar to dorsal spines, the second and third equal and of same length as the latter. Anal rays rapidly decreasing in length to last, which is half that of first. Fin outline straight. Pectoral long, reaching anal, equal to head plus two-thirds of eye diameter. Ventrals $1\frac{1}{2}$ to $1\frac{1}{3}$ in head. Caudal nearly as long as head.

Scales smooth to touch, cycloid, present as a sheath at bases of dorsal and anal, present on cheeks in five or six rows. Lateral line but little arched.

Color of alcoholic specimens uniformly silvery, unscaled portions of head dusky, the iris yellow. Peritoneum black, gill cavity lining clear. A small black spot at beginning of lateral line, in some specimens obsolete; anal fin more or less dusky.

This species is generally common in southern Japan, and may be known at once by its deep body, blunt snout, and long anal fin.

The eye in *Sparus sarba* is described and figured as much larger than in *Sparus aries* (3 to $3\frac{1}{4}$ in head in *S. sarba*, and 4 to $4\frac{1}{2}$ in *S. aries*). The anterior profile is much steeper and more convex in the latter, apparently, than is shown in the plates of *Sparus sarba*. The specimens from Hongkong recorded as *Sparus sarba* by Jordan and Seale are quite identical with the Japanese specimens. The dentition is the same, and not as described. If the Japanese form should prove inseparable from that of the East Indies, it would stand as *Sparus sarba*.

(*aries*, ram.)

28. SPARUS LATUS¹ Houttuyn.

KAIDSU.

Sparus latus HOUTTUYN, Holl. Maat. Wet. Haarlem, XX, Deel. 2, 1782, (Nagasaki).

?*Sparus hasta* BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 275 (Coromandel Coast and India).

Chrysophrys hasta GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 490 (Japan) (part).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denkschr. kais. Acad. Wiss. Wien, 1883, p. 17 (Tokyo).

?*Coius datnia* HAMILTON BUCHANAN, Fish. Ganges, 1822, p. 88, pl. 9, fig. 29 (Ganges).

Sparus datnia BLEEKER, Versl. kon. Acad. Wet., 2 Rks., vol. 11, 1876, p. 5, pl. 2 (Nagasaki, not Calcutta).—BLEEKER, Atlas Ichth., vol. 8, p. 109 (Nagasaki).

?*Sparus berda* CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 113 (Pondicherry).—JORDAN and RICHARDSON, Check List Philippine Island Bur. of Sci., 1, Manila, 1910, p. 31.

Sparus berda RICHARDSON, Ichth. China and Japan, 1846, p. 240 (Canton).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 350 (Formosa).—JORDAN and RICHARDSON, Fishes Formosa, Mem. Carnegie Mus., vol. 4, No. 4, 1909, p. 189 (Formosa), (not *Sparus berda* Forskål, 1775).

Chrysophrys longispinis CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 116 (Japan), (not type, from Calcutta).

?*Calamara* RUSSELL, Fishes of Vizagapatam, vol. 1, 1803, p. 63, pl. 92 (Coromandel).

?*Chrysophrys calamara* CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 117 (Java, Malabar).—CANTOR, Cat. Malay. Fish, 1850, p. 48 (Sea of Pinang).

Chrysophrys auripes RICHARDSON, Ichth. China and Japan, 1846, p. 241 (Canton).

Chrysophrys xanthopoda RICHARDSON, Ichth. China and Japan, 1846, p. 241 (Canton).

¹ The following is the substance of Houttuyn's account of *Sparus latus*: "I have called this species in which the scales are placed in stripes lengthwise 'wide sea-brassen' because it is one of the widest of the family, the specimen 3 inches long, an inch and a half wide. Color yellowish, silvery under the scales. D. XII, 9; A. III, 8."

Chrysophrys schlegeli BLEEKER, Nat. Tijd. Ned. Ind., vol. 6, 1854, p. 400 (part, specimen with 45 scales), (Nagasaki); Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, pp. 20 and 86 (Nagasaki).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 80 (part).

Sparus chrysopterus KISHINOUE, Zool. Mag. Tokyo, vol. 19, 1907, p. 327 (Kiusiu, Shikoku, Inland Sea and Pacific coast of Central Hondo).

Habitat.—Southern Japan and China.

Described from a specimen 155 mm. long from Kobe and one 190 mm. long from Wakanoura, besides four specimens 100 to 108 mm. in body length from the latter place.

Head $3\frac{1}{4}$ in body length; depth of body $2\frac{1}{3}$; eye $4\frac{1}{3}$ in head; depth of preorbital 6; second anal spine $1\frac{1}{2}$ in head; D. XI, 11 or 12; A. III, 8; scales in lateral line 45, in transverse series 5 or 6/12; gill rakers 6 + 9 or 10.

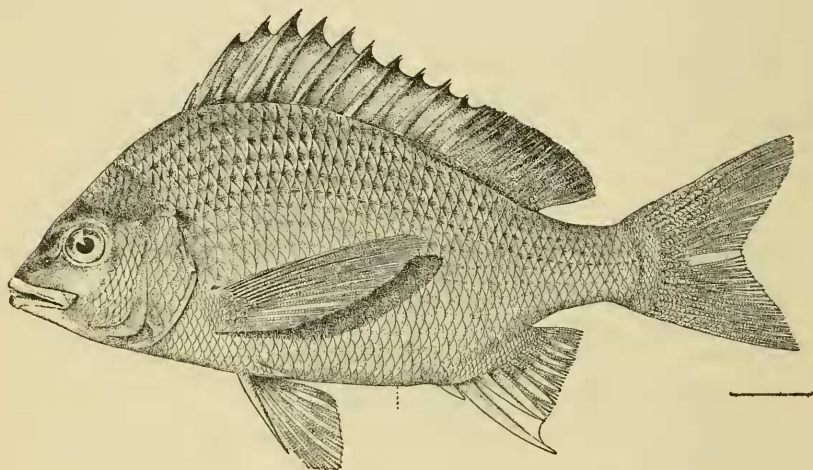


FIG. 10.—SPARUS LATUS.

Dorsal profile of head nearly straight to occiput, body profile most strongly arched anteriorly, sometimes slightly concave behind eyes. Snout more pointed than in *S. aries*, the upper profile not approaching the vertical; lower jaw not included, upper jaw not overhung by tip of snout; preorbital narrow, not as broad as eye is long. Interorbital space arched moderately. Maxillary ending under center of pupil, $2\frac{1}{2}$ in head; preopercle very minutely serrated, not flexible. Teeth in jaws only; lower jaw with two rows posteriorly, both of rounded molars; inner row broadest save posteriorly, where it is replaced by much smaller ones; both becoming granular anteriorly. A third inner row of small rounded molars present along anterior halves of each mandible. Upper jaw with three rows of rounded molars in front, the outer conical anteriorly, the middle row extending only half way to snout, where it is replaced by another row inside of the third, all becoming granular anteriorly. Six conical canines present in front in each jaw.

Third and fourth dorsal spines longest, $1\frac{3}{4}$ to 2 in head, last spine $2\frac{1}{2}$ in head. Dorsal rays but little longer than the latter. Anal spines very strong, heavy, the second strongest, $1\frac{1}{3}$ to $1\frac{1}{2}$ in head, third $2\frac{1}{3}$ to $2\frac{1}{4}$ (in adults). First ray much shorter than second spine but equal to third, tip of second spine nearly coinciding with that of last ray when supine, or extending beyond its middle. Pectorals long, falcate, reaching third anal spine, equal to head plus eye diameter. Ventrals $1\frac{1}{3}$ in head. Caudal forked, nearly as long as head.

Scales very slightly ctenoid below lateral line, present as low sheath at bases of vertical fins; rows on cheek 6 or 7. Lateral line more strongly arched anteriorly than in *S. aries*.

Color of alcoholic specimens uniform, save for indistinct small blotch at upper angle of gill opening. Dorsal margined strongly and somewhat shaded below with black. Anal lightly stippled with black; a faint dusky shade at base. Caudal margined with black. Scale rows indicated by longitudinal stripes, but not as prominently as in *Sparus aries*. A dark spot at origin of lateral line. Peritoneum silvery. Gill cavity lining colorless. In life silvery with dark brown streaks; fins and lower lobe of caudal bright golden.

It is very questionable whether this fish extends into the Indian Seas, or beyond Formosa. Bleeker considered it identical with specimens from Calcutta, but says that there is a difference in the number of dorsal spines, 12 in the Indian, 11 in Japanese. His first description of *S. schlegeli* from Japan was composite, according to his later paper.¹ The characters were certainly taken from the species here called *S. swinhonis*, and not from the present species. However, he applied the name *S. schlegeli* to the latter, and identified it with Indian specimens. He decided that *S. hasta* was distinct from either, as it probably is. On this basis his Indian synonymy has been worked out. *Sparus berda* of Forskål, from the Red Sea, is not the same as our fish, if we may judge by Rüppell's figure, and all published descriptions from that locality. Steindachner and Döderlein say² that *Chrysophrys cuvieri*, *schlegeli*, *datnia*, and *hasta* of Bleeker are the same species in all probability, but the evidence available is all against this view. A careful comparison of actual specimens from all localities will be necessary to decide the number of species present.

We adopt for the Japanese fish the name *Sparus latus*. Houttuyn's careless description has three distinct characters of the species, the deep body, the rows of olive spots on the rows of scales, and the presence of rays III, 8 in the anal. *Sparus aries* has the anal III, 11. *Sparus swinhonis* has no distinct rows of spots. The name *Sparus berda*, from the Red Sea, is older than Houttuyn's name, and it may prove, after all, that the two species are identical, although the present evidence points to the contrary. If the pre-

¹ Versl. kon. Acad. Wet., vol. 11, 1876, p. 5.

² Beitr., vol. 2, 1883.

ceding species is called *Sparus sarba*, this one may well be *Sparus berda*. But our material is inadequate to settle either question.

We consider *Sparus chrysopterus* Kishinouye identical with the present species as there is no character given by which it may be distinguished. The black spot "in the anal fin near its base" is represented in our specimens by a slight dusky shade. Mr. Kishinouye gives the following translation of the original description:

D. XI, II; A. III, 8. Scales 4 or 5-42-11. Pyloric cæca 4. Vertebrae 24. Height of the body $2\frac{1}{2}$ in the total length with caudal, and the length of head $4\frac{1}{3}$ in the same. Snout obtuse and the supraoccipital region is a little elevated. Incisors 4-6 in each jaw, and molars are weakly developed and sparsely distributed in 3 irregular rows. The second spine of the anal very long, longer than the length of the insertion of the same fin. Grayish or greenish gray at the back and silvery white at the abdomen. A black spot respectively near the origin of the lateal line and in the anal fin near its base. Ventrals, anal, and the lower lobe of the caudal yellow.

It is told that this species grows to the length of about 36 cm. This species seems to spawn in the autumn. Known from warmer parts of our country—Kiushiu, Shikoku, Inland Sea, and at the Pacific coast of the central part of Hondo.

This species is generally common in southern Japan. Our specimens are from Wakanoura and Kobe.

(*latus*, broad.)

29. SPARUS SWINHONIS Günther.

KURODAI (black porgy).

Chrysophrys longispinis TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 68, pl. 32 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 240 (on specimen of Temminck and Schlegel), (not of Cuvier and Valenciennes).

Chrysophrys schlegeli BLEEKER, Japan, Nat. Tijds. Ned. Ind., vol. 6, 1854, p. 400 (Nagasaki) (part, not of described specimen); Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 86 (after above). (See Versl. kon. Acad. Wet., 2 Rks., vol. 11, 1876, p. 7.)

Sparus swinhonis GÜNTHER, Ann. and Mag. Nat. Hist., 1874, p. 155 (Chifu in China).

Sparus schlegeli BLEEKER, Versl. kon. Acad. Wet., 2 Rks., vol. 11, 1876, p. 2 (Nagasaki), (not of Nieuwe Nalez., p. 86).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 80 (Japan), (in part).

Sparus longispinis JORDAN and RICHARDSON, Fishes Formosa, Mem. Carnegie Mus., vol. 4. No. 4, 1909 (Takao).

Habitat.—Coasts of southern Japan and China.

Description of a specimen from Kobe, one from Wakanoura, and 12 from Tokyo. Body lengths from 60 to 225 mm.

Head $3\frac{1}{2}$ in length of body, depth $2\frac{3}{4}$; eye $4\frac{2}{3}$ to 5 in head; depth of preorbital 6; D. XI, 12; anal III, 8; scales in longitudinal series 53 to 56 to last vertebra; in transverse series between insertions of dorsal and of anal 7/15; gill-rakers 6+8.

Dorsal profile similar to that of *Sparus latus*; straight from snout to occiput; most strongly arched anteriorly; sometimes slightly concave behind eyes. Snout somewhat pointed, upper profile not overhanging premaxillaries. Lower jaw not included, equal to upper.

Preorbitals not as broad as eyes. Interorbital space occasionally slightly gibbous. Maxillary $2\frac{1}{2}$ in head, ending under anterior half of eye. Preopercle very minutely serrated. Teeth in jaws much as in *S. latus*, in three rows above, in two below, all rounded molars save outer row above, which is somewhat incisorlike anteriorly, and all becoming granular in front. Six moderate canines present in front on each jaw.

Dorsal spines longest in third and fourth, $2-2\frac{1}{2}$ in head, last $2\frac{1}{5}$ to $3\frac{1}{4}$; dorsal rays of nearly equal length, about $2\frac{1}{5}$ in head. Anal spines of moderate strength, between those of *S. aries* and *S. latus*; second contained 2 to $2\frac{1}{2}$ in head, third $2\frac{3}{4}$ to $2\frac{3}{4}$. First anal ray nearly equal to length of second spine, and longer than third. Fin outline straight or but slightly concave, tip of second spine not extending beyond middle of last ray, when supine. Pectoral long, falcate, reaching to second anal spine. Ventrals $1\frac{1}{2}$ in head. Caudal nearly equal to head.

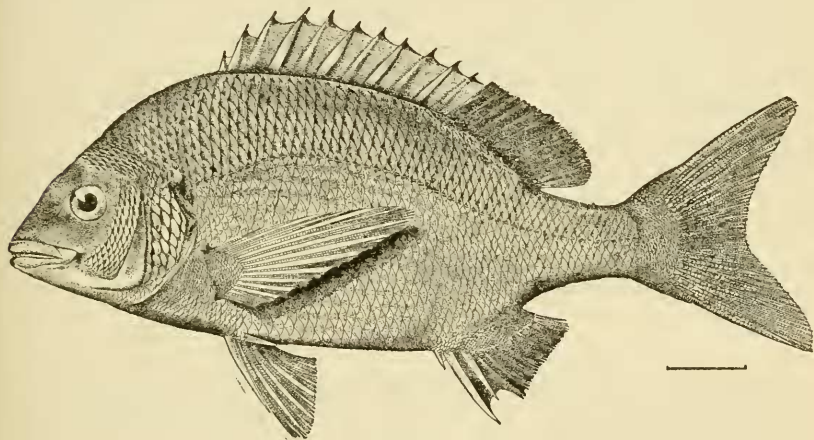


FIG. 11.—SPARUS SWINHONIS.

Scales slightly ctenoid below lateral line; not present on snout, preorbitals, jaws, interorbital space, or preopercular margin; present as a low sheath along bases of vertical fins, on cheek in 7 or 8 rows.

Color of alcoholic specimens uniform, those from Tokyo with darker color, probably because of preservation. Rows of scales indicated by prominent stripes on cheeks as well as on body. Vertical fins all dusky, dorsal margined with denser black, pectorals and ventrals somewhat clearer; anal largely black. Peritoneum silvery, gill cavity clear.

This species differs from *Sparus latus* in a greater number of scales, lower dorsal and anal spines, the latter not reaching beyond half the length of the last ray, beside several smaller points of difference.

This well-marked species is very common in southern Japan and China. Our specimens are from Tokyo, Wakanoura, and Kobe. It

has been confused with *Sparus latus* under the name of *schlegeli* and with *Sparus longispinis* from India, but it is distinct from both, and it is not yet recorded from the East Indies.

(Named for Mr. R. Swinhoe, consul at Chifu.)

7. Family KYPHOSIDÆ.

The RUDDER FISHES.

Herbivorous fishes, with incisor teeth only in the front of the jaws. Body oblong or elevated, with moderate or small scales, ctenoid or smooth. Mouth moderate, with incisor-like teeth in the front of each jaw; no molars; teeth on vomer and palatines present or absent; premaxillaries moderately protractile; preorbital rather narrow, sheathing the maxillary. Gill rakers moderate; pseudobranchiæ well developed; opercles entire. Gills 4, a slit behind the fourth; gill membranes separate, free from the isthmus; dorsal fin continuous or divided, with 10 to 15 rather strong spines, the soft dorsal naked or scaly; anal with 3 spines; ventrals thoracic, the rays I, 5, an accessory scale at base; caudal lunate or forked; pectoral fin with all its rays branched. Intestinal canal elongate, with few or many pyloric cæca. Air bladder usually with 2 posterior horns. Vertebrae in ordinary or slightly increased number, 24 to 28. Post-temporal of normal percoid form, the stout forks not adnate to the cranium. Herbivorous shore fishes, feeding largely on green or olive algæ; chiefly of the Mediterranean Sea and the Pacific Ocean; most of them valued as food.

Key to genera.

- a*¹. GIRELLINÆ. Soft part of dorsal and anal fins naked or partly scaled; head more or less naked; teeth in broad bands, all freely movable, none on vomer; pyloric cæca very numerous; vertebrae in somewhat increased number. Pacific Ocean.
- b*¹. Incisors all tricuspid.
 - c*¹. Dorsal spines 14 or 15; each jaw with a series of flat, movable, tricuspid incisors, behind which is a broad band of similar smaller ones; dorsal continuous, its spines low.....*Girella*, 18.
- a*². KYPHOSINÆ. Soft parts of vertical fins closely scaled; teeth more or less fixed, usually present on vomer, pyloric cæca numerous.
 - d*¹. Top of head as well as sides and jaws closely scaled; broad bands of teeth behind the incisors; villiform teeth on vomer, palatines and tongue; dorsal spines low; incisor teeth lanceolate.
 - e*¹. Incisor teeth strong, with horizontal, backward projecting roots; soft dorsal and anal not much elevated.
 - f*¹. Incisor teeth well developed, each with a conspicuous horizontal process or root; caudal fin moderate, about as long as the head, the outer rays not 3 times as long as middle rays; junction of gill membranes forming an angle.....*Kyphosus*, 19.

18. Genus GIRELLA Gray.

Girella GRAY, Ill. Ind. Zool., about 1835 (*punctata*).
Melanichthys TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 75 (*melanichthys*).
Camarina AYRES, Proc. Cal. Acad. Sci., 1860, p. 81 (*nigricans*).

Type.—*Girella punctata* Gray.

Body oblong-ovate, compressed, covered with rather large scales. Mouth small, with a series of tricuspid, movable incisors, behind which is a broad band of similar smaller ones; no molar teeth; no teeth on vomer or tongue; lower pharyngeal teeth slender. Cheeks with very small scales; opercles and top of head chiefly naked. Gill rakers slender. Dorsal fin rather low, with about 14 spines, on the bases of which the scales extend, forming an imperfect sheath; no groove at base of dorsal; no procumbent dorsal spine; anal spines small, graduated; caudal lunate. Air bladder divided into 2 posterior horns. Pyloric cæca numerous; intestinal canal elongate; peritoneum black. Vertebræ 11+16 or 17=27 or 28. Herbivorous. Pacific Ocean. This genus contains several species found on the east coast of Asia and one characteristic of the rocky shores of California. They are herbivorous fishes, feeding on seaweeds.

(From the French “Girelle,” which is a derivative of Julis, and is applied to smaller Labroids.)

Key to species.

- a¹. Dorsal rays XV, 13; anal rays III, 12; scales about 53; a dark spot on each scale on sides, these forming lengthwise stripes; no dark opercular flap; no pale vertical band *punctata*, 30.
- a². Dorsal rays XIV, 14.
 - b¹. Scales about 50; scales with dark edges; opercular flap pale; young with a whitish vertical bar at the shoulder; anal rays III, 11; lower half of opercle scaled *mezina*, 31.
 - b². Scales about 62; scales all dark; sides without longitudinal streaks of spots; no pale bar at shoulder; anal rays III, 13; lower half of opercle scaleless.

melanichthys, 32.

30. GIRELLA PUNCTATA Gray.

MEJINA.

Girella punctata GRAY, Ill. Ind. Zool., 1830–1835, pl. 98, fig. 34 (Canton).
Crenidens punctatus RICHARDSON, Ichth. China and Japan, 1842, p. 242 (Canton), (dorsal rays XV, 14).
Girella punctata GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 427 (Canton and Japanese Seas), (not synonymy).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japans, II, Denkschr. kais. Akad. Wiss. Wien., 1883, p. 21 (Tokyo).—NYSTRÖM, K. Svenska. Vet. Akad., vol. 13, Afd. 4, No. 4, 1887, p. 15 (Nagasaki).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 80 (Yokohama).—ISHIKAWA, Prel. Cat. Tokyo Imp. Mus., vol. 1, 1897, p. 53.—JORDAN and STARKS, U. S. Nat. Mus., vol. 32, 1907, p. 497, fig. 5 (Wakanoura, Tokyo, Yokohama, Nagasaki, Misaki, and Tsuruga).

Habitat.—Coasts of southern Japan and China.

Description of specimens from Tsuruga, Akune in Satsuma, Nagasaki, and Tokyo; ranging from very young to 30 cm. in body length, a specimen 15.5 cm. long from Tokyo, taken as typical.

Head $3\frac{3}{8}$ in length to last vertebra; depth $2\frac{2}{5}$; eye 4 ($3\frac{1}{2}$ –5) in head; snout 3; maxillary $3\frac{1}{3}$; interorbital space $2\frac{1}{2}$ to $2\frac{3}{4}$; D. XV, 13; A. III, 12; scales in lateral line 50 to 56; in transverse series between insertion of dorsal and anal 9/18.

Snout not greatly rounded; premaxillaries at tip not vertical but protruding, their upper edge nearly on level of nostrils. Jaws equal, maxillary ending below posterior nostril or before eyes, mouth strongly oblique. Prefrontals somewhat prominent. Distance of preopercular margin from posterior border of eye contained $1\frac{1}{2}$ in eye. Preopercle finely serrated on upright limb, only partially on horizontal. Cheek

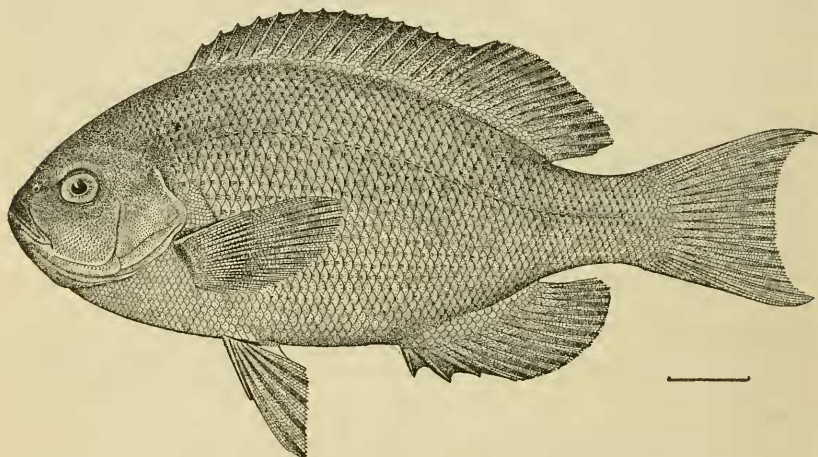


FIG. 12.—*GIRELLA PUNCTATA*.

longer than deep, measured from eye to lower margin of preopercle and from end of maxillary to vertical margin of preopercle. Gill-rakers 26 to 30 on lower limb of first arch. A single series of tricuspid teeth in both jaws backed by a band of much smaller ones.

Dorsal spines increasing in length to last, which is 2 in head. Dorsal rays slightly longer. Third anal spine longer than second, and contained thrice in head. Soft dorsal and anal fin straight, posterior angles rather pointed. Caudal emarginate in adults, truncate in young, lobes not rounded. Pectorals slightly shorter than head, tips rounded. Ventrals reaching anus, $1\frac{2}{5}$ in head.

Scales roughly ctenoid, smooth to touch on head. Present on proximal half of pectoral, two-thirds of dorsal and anal, and in two or three small rows along bases of dorsal and anal fins. Head scaled to between eyes, on cheeks and suborbitals, minutely on upper limb of preopercle, not on lower, and on upper half of opercle. No scales on subopercle or lower half of opercle, and only occasional scales on interopercle. Snout and jaws naked.

Color in alcohol uniform brown, dark greenish in life, lighter along ventral edge of body and head. Dorsal fin as dark as body; caudal more lightly colored; ventrals light, or white, on lower side save at dark tips, and darker above; pectorals similar, a narrow dark bar across their bases. Scale rows marked by a dark spot at base of each scale. Preopercular flap colored like the body.

This species is generally common on the shores of southern Japan. We have seen specimens of various sizes from Tsuruga, Akune, Wakanoura, Tokyo, Yokohama, Misaki, and Nagasaki. It is valued as a food fish.

It is easily known by the number of 15 dorsal spines, and by the presence on the sides of stripes along the rows of scales.

(*punctatus*, spotted.)

31. GIRELLA MEZINA Jordan and Starks.

Girella mezinga JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, 1907, p. 496, fig. 3 (Naha, in Riu Kiu Islands).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, No. 4, 1909, p. 190 (Takao in Formosa).

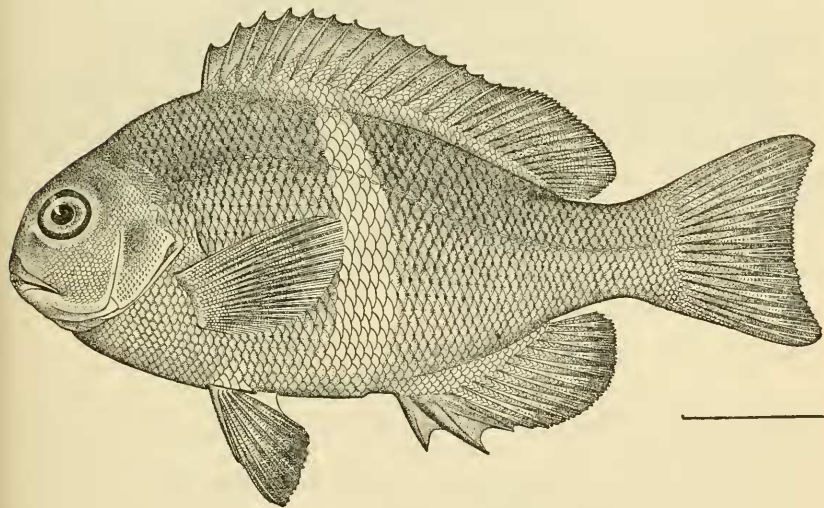


FIG. 13.—GIRELLA MEZINA.

Habitat.—Southern Japan to Formosa.

Description of a specimen 73 mm. in total length from Misaki, Japan, collected by Professor Snyder,¹ and of the type and two cotypes of the species from Naha, Okinawa, Riu Kiu Islands.

Head $3\frac{2}{3}$ in length to base of caudal; depth $2\frac{1}{4}$; eye $3\frac{1}{2}$ in head; maxillary 3; interorbital space $3\frac{2}{3}$; D. XIV, 14; A. III, 11; scales in lateral line 50, in transverse series between insertions of dorsal and anal 8/17.

¹ Record by permission taken from Snyder's manuscript notes.

Snout much rounded in profile; premaxillaries vertical or slightly receding, their upper margin at or below level of lower border of eye, in very young the premaxillaries protrude as in the other species. Maxillary ending under or slightly behind anterior border of eye. Depth of cheek from eye to horizontal border of preopercle greater than its length from end of maxillaries to vertical margin. Vertical margin of preopercle finely serrated, lower but partially. Teeth three pointed. Gill-rakers 22 on lower limb of first arch.

Dorsal spines increasing to last, which is 2 in head. Dorsal rays $1\frac{1}{2}$. Second anal spine equal to third, $2\frac{1}{3}$ in head. Pectoral $1\frac{1}{2}$ in head, ventrals $1\frac{1}{2}$, the latter's spines $2\frac{1}{3}$. Posterior angle of dorsal not pointed. Anal margin rounded, as is pectoral tip. Caudal emarginate or lunate, less nearly truncate in young, angles not very sharp.

Scales roughly ctenoid. Head scaled to above anterior margin of eyes, and on all opercles but the interopercle, including the lower half of the opercle. Rows extending up both anal and dorsal spines, and over basal half of soft fins.

Color in alcohol comparatively light, darker above. A conspicuous white band usually present across body from eighth or ninth dorsal spines toward anus, never reaching it, and vanishing sometimes before lateral line, this band more indistinct with age, or even becoming obsolete. Dorsal, anal, and caudal dark, apparently somewhat mottled. Pectorals and ventrals lighter, former with an indistinct bar across its base, latter darker above. Scale rows marked by darker margin of scales. Opercular flap pale.

Of this species we have seen the original type, from the Riu Kiu Islands, and one example taken by Professor Snyder at Misaki.

(*Mejina*, the local name.)

32. GIRELLA MELANICHTHYS (Richardson).

KUROMEJINA (black mejina).

Melanichthys TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 75, pl. 39, (Nagasaki).

? *Crenidens leonina* RICHARDSON, Ichth. China and Japan, 1846, p. 242, (Canton); (may be *Girella mezina*).

Girella leonina JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, 1907, p. 496, fig. 4 (Wakanoura).

Crenidens melanichthys RICHARDSON, Ichth. China and Japan, 1846, p. 243 (after Temminck and Schlegel).

Girella melanichthys BLEEKER, Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 8 (= *Melanichthys* Schlegel = *Melanichthys crenidens* Bleeker), [Kiusiu, Nagasaki].

Melanichthys crenidens BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 20 (= *Crenidens melanichthys* Richardson) (Japan, China).

Habitat.—Southern Japan and China.

Description of a specimen 145 mm. in body length from Wakanoura, Japan.

Head $3\frac{1}{2}$ in length to last vertebra; depth $2\frac{1}{2}$; eye $4\frac{1}{2}$ in head; snout 3; maxillary $3\frac{1}{2}$; interorbital space 3; depth of preorbital 5; D. XIV, 14; A. III, 13; scales in lateral line 62, in transverse series 13 + 22 (including 3 smaller rows above and 2 below at insertions of dorsal and anal).

Snout rounded but moderately; premaxillaries protruding, upper edges on level with nostrils; cleft of mouth strongly oblique; distance from end of maxillaries to vertical margin of preopercle greater than distance from eye to horizontal margin. Flaps of nostrils large, tufted. Profile of snout slightly concave, prefrontals prominent. Teeth in jaws in outer two rows tricuspid, outer largest, an inner broad band of much smaller teeth present. Teeth tipped with a transparent brown. Gill-rakers 20 on lower limb of first arch.

Dorsal spines short, last longest, $2\frac{1}{2}$ in head; dorsal rays $2\frac{1}{8}$ in head, margin of fin not rounded posteriorly. Third anal spine longest 3

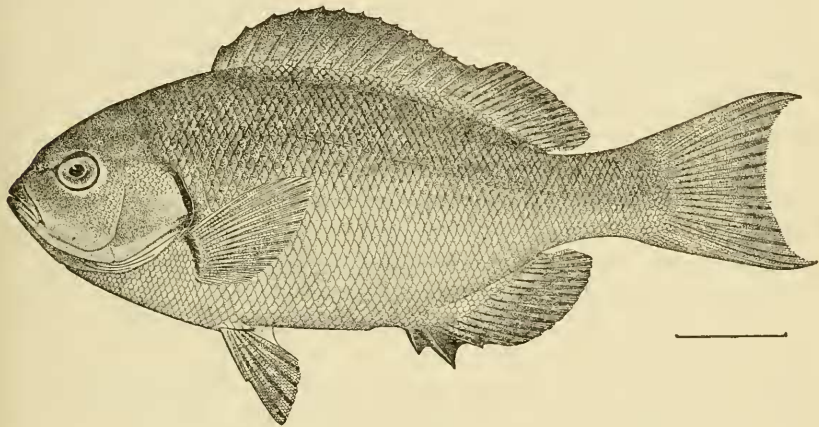


FIG. 14.—GIRELLA MELANICHTHYS.

in head; soft anal margin similar to soft dorsal. Caudal deeply emarginate, lobes acute. Ventrals $1\frac{1}{2}$ in head, their spines $2\frac{3}{4}$. Pectorals $1\frac{1}{4}$ in head.

Scales ctenoid wherever present. Soft dorsal and anal scaled on basal halves, and rows extending out along dorsal spines but apparently not on anal spines. Scales on head extending to between nostrils, buried in skin on upper surface. Lower half of opercle, sub—and interopercle, and lower limb of preopercle naked. Scales on preorbital deeply buried anteriorly. Snout and lower jaw naked.

Color dark greenish in alcohol, much more so above. Opercular flap deep brown or black, as is a bar across base of pectorals. Fins corresponding in color to their respective parts of body. Peritoneum black. Scale rows unmarked by color pattern.

This species is not rare in southern Japan. Our specimens are from Wakanoura. It is readily known by the presence of 14 dorsal spines

and by the plain black color. The opercular flap is black. This may be the *Crenidens leoninus* described by Richardson from Canton as having 14 dorsal spines, but his scant account applies equally well to *Girella mekina*. We have therefore adopted the name which is not open to question.

(μελάς, black; ἰχθύς, fish.)

19. Genus KYPHOSUS Lacépède.

Kyphosus LACÉPÈDE, Hist. Nat. Poiss., vol. 3, 1802, p. 114 (*bigibbus*=*fuscus*).

Pimblepterus LACÉPÈDE, Hist. Nat. Poiss., vol. 4, 1803, p. 429 (*bosqui*=*sectatrix*).

Dorsuarius LACÉPÈDE, Hist. Nat. Poiss., vol. 5, 1803, p. 482 (*nigrescens*=*fuscus*).

Xyster LACÉPÈDE, Hist. Nat. Poiss., vol. 5, 1803, p. 484 (*fuscus*).

Saleima BOWDICH, Excursion Madeira, 1825, p. 238, (*aurata*).

Opisthistius GILL, Proc. Acad. Nat. Sci. Phila., vol. 14, 1862, p. 245 (*tohmel*).

Body elongate-ovate, regularly elliptical, moderately compressed, head short, with blunt snout; eye large; mouth small, horizontal; maxillary barely reaching front of eye; each jaw with a single series of rather narrow obtusely lanceolate incisors, implanted with compressed conspicuous roots posteriorly; behind these a narrow band of villiform teeth; fine teeth on vomer, palatines, and tongue. Branchiostegals 7; gill-rakers long. Preopercle obsoletely serrate; preorbital narrow, covering but little of the maxillary. Squamation very complete, the space between and about the eyes being the only naked part; scales smallish, thick, ctenoid, 50 to 70 in the lateral line, which is continuous; similar scales entirely covering the soft parts of the vertical fins, and extending up on the paired fins. Dorsal fin low, with about 11 spines, which are depressible in a groove of scales, the fin continuous, but the last spines low, so that a depression occurs between the two parts of the fin, the bases of the spinous and soft parts about equal; soft dorsal rather low or elevated in front, not falcate, pointed behind; anal similar to soft dorsal, with three spines; caudal fin moderately forked; pectoral fins small, ventrals well behind them. Intestinal canal long. Pyloric cæca very numerous. Vertebrae 9 or 10+15 or 16=25. This genus contains some 10 species, chiefly confined to the Pacific Ocean, and most of them found in the East Indies.

(κῦφος, a hump, referring to a deformed specimen with a hump back.)

Key to species.

- a*¹. KYPHOSUS; soft dorsal not elevated in front, its longest rays not longer than longest dorsal spine; dorsal rays X, 14; anal rays III, 13. Scales in lateral line 53.....*lembus*, 33.
- a*². OPISTHISTIUS; soft dorsal elevated in front, its longest rays longer than longest dorsal spine; dorsal rays XI, 12, anal rays III, 11. Scales in lateral line about 56.....*cinerascens*, 34.

33. KYPHOSUS LEMBUS (Cuvier and Valenciennes).

Pimblepterus lembus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 7, 1831, p. 269 (Vanicolo).—BLEEKER, Nat. Tijd. Ned. Ind., vol. 4, 1853, p. 469 (Batavia).—BLEEKER, Verh. kon. Akad. Wet., vol. 17, 1877, p. 14.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 498 (Moluccas).—BLEEKER, Atlas Ichth., vol. 9, 1877, p. 15, pl. 364 (Batu, Pinang, Singapore, Java, Celebes, Ternate, Batjan, Amboyna).

Pimblepterus ternatensis BLEEKER, Nat. Tijd. Ned. Ind., vol. 4, 1853, p. 605 (Ternate).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 499.

Habitat.—Coasts of southern Japan and East Indian Seas.

Description of one specimen 360 mm. in total length, from Wakanoura.

Head $3\frac{2}{3}$ in body length; depth $2\frac{1}{4}$; eye $4\frac{1}{2}$ in head; interorbital space $2\frac{1}{2}$; snout 3; maxillary 3; scales in lateral line 53, above 69, below 61; in transverse series to insertions of dorsal and anal 11/19; D. X, 14; A. III, 13; gill-rakers 24 on lower limb of first arch.

Body arched evenly above and below, greatest depth at center of body which is $2\frac{2}{3}$ in total length to tip of middle caudal rays. Head conical, somewhat convex in profile. Prefrontals prominent, interorbital space strongly arched. Nostrils overhung by prefrontals, posterior opening nearly horizontal. Preorbital edge entire; opercle with one obscure point; preopercle with minute serrations (nearly lost with age). Teeth in a single prominent row, 13 or 14 on each side in both jaws, besides supplementary teeth under loose lips; horizontal parts of teeth somewhat longer than vertical, measuring on inner angles. A narrow band of villiform teeth behind these in both jaws; broad patches on vomer, and tongue; narrow bands on palatines.

Dorsal fins slightly notched, longest spines the fourth and fifth, which are contained $2\frac{2}{3}$ in head; dorsal rays not longer than spines, of nearly even length throughout; base of soft dorsal slightly longer than head, and longer than base of spinous dorsal. Anal spines weak, third longest, slightly shorter than eye diameter; first rays $1\frac{1}{2}$ to $1\frac{2}{3}$ times length of last, but with straight fin margin; anal base equal to length of head. Pectorals and ventrals short (tips worn off). Caudal forked, lobes acute.

Scales ctenoid, thickly covering vertical fins, outer side of pectoral and along ventral rays. Snout and jaws naked; maxillary scaled; preorbitals naked, save for occasional buried scale. Rows between center of dorsal fin and ventrals 11/18.

Color in alcohol uniform, darker above, fins similar in color. Margins of scales dark, forming indefinite lines between rows by superposition. Peritoneum black.

This species must be rare in Japan. We obtained one specimen from Wakanoura, the only record from this region.

(λέμβος, a long swift boat.)

34. *KYPHOSUS CINERASCENS* (Forskål).

Sciaena cinerascens (tahmel) FORSKÅL, Descrip. Anim., 1775, p. 53, No. 66, (Red Sea.)

Pimblepterus cinerascens DAY, Fishes India, 1875, p. 143, pl. 35, fig. 3 (Seas of India).—BLEEKER, Atlas Ichth., vol. 8, 1875, p. 15, pl. 364 (Sumatra, Bangka, Cocos, Java, Bali, Solor, Flores, Celebes, Timos, Obi-major, Amboyna, Saparua, Philippines, New Guinea); Enum. Poiss. Verh. kon. Akad. Amst., vol. 18, 1879, p. 8 (Japan).

Kyphosus cinerascens JORDAN and RICHARDSON, Bull. U. S. Bur. Fish., vol. 27, 1908, p. 260 (Calayan).—JORDAN and RICHARDSON, Philippine Islands, Bur. of Sci. Publ. No. 1, Manila, 1910, p. 31.

Pimblepterus tahmel RÜPPELL, N. W. Fische, 1829, p. 35, pl. 10, fig. 4 (Djidda, Red Sea).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 499.—KLUNZINGER, Syn. Fische Roth. Meer., Verh. z. b. Ges. Wien, vol. 20, 1870, p. 795 (part), (Red Sea).

Opisthistius tahmel GILL, Proc. Acad. Nat. Sci., Phila., vol. 14, 1862, p. 242.

Pimblepterus indicus (Kuhl and Van Hasselt) CUVIER and VALENCIENNES, Hist. Nat. Poss., vol. 7, 1831, p. 270 (Java).—TEMMINCK and SCHLEGEL, Fauna Japonica, 1844, p. 86 (Nagasaki).—STEINDACHNER and DÖDERLEIN, Beitr. Fische Japan's, II, Denkschr. kais. Akad. Wiss. Wien, 1883, p. 21 (Tokyo).

Kyphosus indicus JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 80 (Yokohama).

Habitat.—East Indies, north to Japan.

This species was not seen by us. The following account is translated from that given by Steindachner of a specimen from Tokyo, 57 centimeters in length, in the Vienna Museum:

The greatest body depth is between $2\frac{1}{2}$ and $2\frac{1}{3}$, the head length somewhat less than 4 times in the body length. The broad interorbital space is transversely strongly arched. The angle of the mouth lies vertically under the anterior edge of the eye. The scaleless low snout ascends much more sharply than the upper part of the dorsal profile of the head rises to the occiput. Both margins of the preopercle are toothed (serrated).

The sixth to eighth dorsal spines are equal in height and are the highest of the fin; each is at least half the head length, while the greatest height of the soft dorsal is equal to only two-thirds of the head length. The lateral line irregularly skips several scales and has 55-56 scales from the shoulder to the beginning of the caudal, while there are 70 to 73 scales between the head and caudal.

D. XI, 12. A. III, 11. L. tr. 12/1/22.

Stomach moderately large, intestine much convoluted, both filled with fragments of algæ. Air bladder large, pancreas rather small.

Iron gray, darker above, passing into white below. Ventrals blackish. On the lower end of the pectoral base a brownish black spot. Scaleless preorbital is shiny silvery-gray.

A specimen of this genus, with deep body, probably belonging to this species, was seen alive by us in the aquarium at Asakusa Park, near Tokyo.

The above synonymy, after Bleeker, is more or less open to question. This fish is, however, probably the original *cinerascens* of Forskål, which has the dorsal XI, 12 and the soft dorsal elevated. The latter character probably varies with age. Day's figure represents it but very slightly higher than the spines. Steindachner's

specimen, as stated above, possessed higher spines by a half than is given by any descriptions and figures or is shown by our small specimen from Calayan (3 in head). The same is true of the soft dorsal.

(*cinerascens*, becoming ashen.)

S. Family ERYTHRICHTHYIDÆ.

Sparoid fishes with the body spindle-shaped and the mouth toothless or with small deciduous teeth. Body elongate, not much compressed, covered with moderate, ciliated scales; head scaly, except the tip of snout; premaxillaries excessively protractile, the spines extending to the occiput; maxillary rather broad, slipping under the preorbital; lower jaw projecting; no teeth on palate; lower pharyngeals with cardiform teeth; preopercle entire or with flat thin serrae; opercle ending in a flat point. Dorsal fins separate with free spines between, the first with slender spines, the number about 15; soft dorsal moderate, low, naked, with a sheath of scales at base, both dorsal and anal with the last ray produced; anal with three small spines and about nine rays. Caudal widely forked. Pylorus cæca few. This family, provisionally adopted, contains but few species, all of them fishes of rather deep water, of bright colors and active movements, their relationships uncertain. They have much in common with *Aphareus* among the Lutianidæ. They have also qualities in common with the Gerridæ. Jordan and Evermann associated them with the European genera *Merolepis* Rafinesque (= *Mæna* Cuvier), and *Spicara*, to form a family Mænidæ. This name Mænidæ is not eligible, and *Erythrichthys* has little in common with *Merolepis* save the protractile mouth. Besides *Erythrichthys*, the genera *Dipterygonotus* and *Inermia* in this family are probably valid.

20. Genus ERYTHRICHTHYS Temminck and Schlegel.

Erythrichthys TEMMINCK and SCHLEGEL, Fauna Japonica, p. 117, 1845 (*schlegeli*).

?*Emmelichthys* RICHARDSON, Voyage *Erebus* and *Terror*, 1846, p. 47 (*nitidus*).

?*Boxaodon* GUICHENOT in Gay, Histoire de Chile, vol. 2, 1847, p. 208 (*cyanescens*).

Type.—*Erythrichthys schlegeli* (Bleeker).

This genus has the maxillary very broad and scaly, and the preopercular angle nearly a right angle. Whether the same is true of the other (nominal) genera of this group we do not know. The allied genus *Dipterygonotus* Bleeker is said to have the maxillary naked.

In *Inermia* the maxillary is narrow.

(ἑρυθρός, red; ἰχθύς, fish.)

35. *ERYTHRICHTHYS SCHLEGELI* (Bleeker).

Erythrithys TEMMINCK and SCHLEGEL, Fauna Japonica, 1845, p. 117, pl. 63, fig. 1 (Nagasaki).

Emmelichthys schlegeli BLEEKER, Nieuwe Nalez. Verh. Bat. Gen., vol. 26, 1857, p. 20 (after Temminck and Schlegel); Enum. Poiss., Verh. kon. Akad. Amst., vol. 18, 1879, p. 8.—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, p. 82, 1901 (Yokohama).

Erythrithys schlegeli GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 395 (after Temminck and Schlegel).

Habitat.—Coasts of southern Japan.

Description of two specimens, 410 and 400 mm. in total length, from Tokyo and one from Misaki, 155 mm. Measurements of head, including lower jaw.

Head $3\frac{1}{3}$ to $3\frac{1}{2}$ in body length; depth 4; eye $3\frac{2}{3}$ in head; maxillary $2\frac{1}{3}$; snout $3\frac{3}{4}$; interorbital space $3\frac{2}{3}$; D. XI, 11; A. III, 10; scales

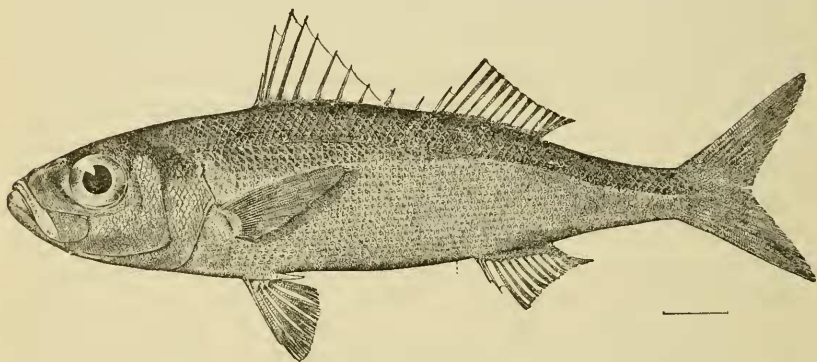


FIG. 15.—*ERYTHRICHTHYS SCHLEGELI*.

in lateral line 65 to 72; in transverse series between dorsal and anal insertions 10/17; gill-rakers 25 on lower limb of first arch; branchiostegals 7.

Body outlines evenly symmetrical; caudal peduncle slender, its depth $4\frac{2}{3}$ in head (to tip of lower jaw), and with a distinct ridge on each side along lateral line; breadth of body contained about twice in its depth. Axis of head coinciding with that of body; lower jaw projecting, its tip conical, produced; maxillary breadth two-thirds of that of eye, ending under anterior margin of pupil; upper lip broad, its breadth $4\frac{1}{2}$ in eye. Nostrils situated nearer center of eye than tip of snout; close together, separated by less than breadth of anterior one. Eye without prominent adipose lids. Preopercular margin flexible, slightly crenate, vertical limb not deeply concave, but straight, its angle less than 45° . Opercular points two, separated by half diameter of eye; above upper a smaller more obscure one. Teeth in jaws minute, present anteriorly only, all pointing backward. Palatines with a small band or patch.

Dorsals not separated (appearing thus only when interradi al membrane is broken). Dorsal spines slender, flexible, third longest $1\frac{7}{8}$ in head, penultimate shorter than last. Longest ray is first, $2\frac{3}{4}$ in head. Soft dorsal base $7\frac{1}{2}$ in body length. Second anal spine slightly more than half length of third, which is $4\frac{3}{8}$ in head. Soft anal similar to soft dorsal; its longest ray 3 in head; its base $7\frac{3}{8}$ in body length. Pectorals contained $1\frac{1}{2}$ in head; ventrals 2, latter reaching less than half way to anal insertion. Caudal deeply forked.

Scales roughly ctenoid, present on whole of head (including preopercle) save lips, and on bases of soft dorsal and anal as a heavy sheath.

Colors uniformly light brown in alcohol, more silvery and lighter below. Fins uniform. Peritoneum silvery.

Of this species we have seen the three specimens mentioned above. It is certainly rare in Japan.

(Named from Prof. H. Schlegel, of Leyden.)

NOTE ON ERYTHRICHTHYS SCINTILLANS JORDAN AND THOMPSON, A
NEW SPECIES FROM HAWAII.

The Hawaiian species described and figured by Jordan and Evermann as *Erythrichthys schlegeli*¹ seems to be a distinct species for which we suggest the name of *Erythrichthys scintillans*.

The most striking difference is the longer anal base in *E. scintillans* which is contained $6\frac{1}{3}$ in the body length, and is to that of our Japanese specimens of *E. schlegeli* as 0.16 is to $0.12\frac{1}{2}$, using measurements in hundredths of body length. Other differences are, a longer soft dorsal base, $5\frac{3}{4}$ in body length; larger eye, $3\frac{1}{4}$ in head; greater body depth, $3\frac{1}{2}$ in length; greater depth of caudal peduncle, which in Japanese specimens is only two-thirds of that in *E. scintillans*; longer second anal spine, five-sixths of length of third; ventrals extending over half way to anal insertion; the small upper point on the opercle is lacking; the opercular points are nearer together, the distance between them only one-quarter of the eye diameter; the vertical preopercular margin is deeply emarginate, and the nostrils are midway between the center of the eye and the tip of the premaxillaries, hence farther before the eye than in those from Japan despite its own larger eye.

We may adopt as our type of *E. scintillans* the specimen described and figured by Jordan and Evermann. The characters noted are all verified on the example before us, collected by Doctor Jordan at Hilo, Hawaii.

¹ Bull. U. S. Fish Comm., vol. 23, pt. 1, 1903, p. 245, pl. 19.

SUMMARY (WITH LOCALITIES FROM WHICH JAPANESE SPECIMENS WERE TAKEN).

1. Family KUHLIDÆ.

1. *Boulengerina* Fowler, 1906.

1. *tæniura* (Cuvier and Valenciennes), 1829; Tanegashima, Misaki.

2. *Kuhlia* Gill, 1861.

2. *marginata* (Cuvier and Valenciennes), 1829; Izu.

2. Family PRIACANTHIDÆ.

3. *Priacanthus* (Cuvier), 1817.

3. *hamrur* (Forskål), 1775.

4. *macracanthus* Cuvier and Valenciennes, 1829; Tokyo, Nagasaki.

5. *japonicus* Cuvier and Valenciennes, 1829; Tokyo, Misaki, Bingo.

4. *Pseudopriacanthus* Bleeker, 1869.

6. *niphonius* (Cuvier and Valenciennes), 1829.

3. Family THERAPONIDÆ.

5. *Therapon* Cuvier, 1817.§ *Therapon*.

7. *servus* (Bloch), 1797; Kagoshima.

§ *Pelates* Cuvier, 1829.

8. *oxyrhynchus* Temminck and Schlegel, 1842; Nagasaki, Tokyo, Kochi, Shimizu, Suruga, Wakanoura, Kagoshima, Akune, Nagaoka.

4. Family BANJOSIDÆ.

6. *Banjos* Bleeker, 1879.

9. *banjos* (Richardson), 1846; Tokyo, Osaka, Fusan.

5. Family HÆMULIDÆ.

7. *Parapristipoma* Bleeker, 1872.

10. *trilineatum* (Thunberg), 1793; Tokyo, Misaki, Enoshima, Wakanoura, Nagasaki.

8. *Plectorhynchus* Lacépède, 1801.§ *Diagramma* Cuvier, 1817.

11. *pictus* (Thunberg), 1792; Onomichi, Nagasaki.

§ *Plectorhynchus*.

12. *cinctus* (Temminck and Schlegel), 1842; Yokohama, Misaki, Wakanoura.

9. *Hapalogenys* Richardson, 1844.

13. *nigripinnis* (Temminck and Schlegel), 1843; Wakanoura, Tsuruga.

14. *mucronatus* (Eyedoux and Souleyet), 1841; Kobe, Onomichi, Hiroshima.

15. *kishinouyei* Smith and Pope, 1907; Urado.

10. *Scolopsis* Cuvier, 1817.

16. *incermis* (Temminck and Schlegel), 1843; Nagasaki.

6. Family SPARIDÆ.

11. *Lethrinus* Cuvier, 1829.§ *Lethrinichthys* Jordan and Thompson, 1911.17. *nematacanthus* Bleeker, 1854; Tokyo, Wakanoura.18. *hæmatopterus* Temminck and Schlegel, 1844; Nagasaki.§ *Lethrinus*.19. *chærorhynchus* (Bloch and Schneider), 1801; Urado.12. *Euthyopteroma* Fowler, 1904.20. *virgatum* (Houttuyn), 1782; Tokyo, Nagasaki.21. *bathybium* (Snyder), 1911; Kagoshima.13. *Gymnocranius* Klunzinger, 1870.22. *griseus* (Temminck and Schlegel), 1843; Misaki, Wakanoura, Nagasaki.14. *Taius* Jordan and Thompson, 1911.23. *tumifrons* (Temminck and Schlegel), 1843; Tsushima.15. *Erynnis* Jordan and Thompson, 1911.24. *cardinalis* (Lacépède), 1803; Matsushima, Tokyo, Misaki.16. *Pagrosomus* Gill, 1893.25. *major* (Temminck and Schlegel), 1842; Misaki, Tokyo, Wakanoura, Aomori, Nagasaki; Port Arthur..26. *auratus* (Forster) Bloch and Schneider, 1801 (probably not Japanese).17. *Sparus* Linnæus, 1758.27. *arics* (Temminck and Schlegel), 1843; Tokyo, Wakanoura, Nagasaki.28. *latus* Houttuyn, 1782; Kobe, Wakanoura.29. *swinhonis* Günther, 1874; Tokyo, Wakanoura, Kobe.

7. Family KYPHOSIDÆ.

18. *Girella* Gray, 1835.30. *punctata* Gray, 1835; Misaki, Wakanoura, Tokyo, Yokohama, Tsuruga, Akune, Satsuma, Nagasaki.31. *mezina* Jordan and Starks, 1907; Misaki.32. *melanichthys* (Richardson), 1846; Wakanoura.19. *Kyphosus* Lacépède, 1802.§ *Kyphosus*.33. *lembus* (Cuvier and Valenciennes), 1831; Wakanoura.§ *Opisthistius* Gill, 1862.34. *cinerescens* (Forskål), 1775; Tokyo.

8. Family ERYTHRICHTHYIDÆ.

20. *Erythrichthys* Temminck and Schlegel, 1845.35. *schlegeli* (Bleeker), 1857; Tokyo, Misaki.